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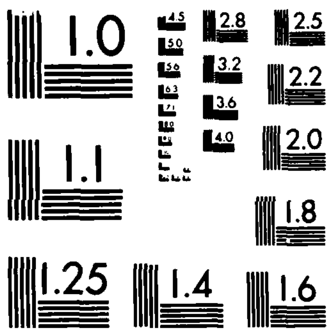

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DEPUTY COMMANDER FOR MAINTENANCE
EXPERIENCE AND EFFECTIVENESS:
IS THERE A RELATIONSHIP?

THESIS

Lonnie J. Collins
Captain, USAF

AFIT/GLM/LSM/85S-15

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DEPUTY COMMANDER FOR MAINTENANCE EXPERIENCE AND EFFECTIVENESS: IS THERE A RELATIONSHIP?

THESIS

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the

Requirements for the Degree of

Master of Science in Logistics Management

Lonnie J. Collins, B.S.

Captain, USAF

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Abstract

This research effort investigated limited breadth of experience (stovepiping) and limited depth of experience as they relate to the aircraft maintenance Deputy Commander for Maintenance (DCM). The investigation first looked for evidence of these conditions in the DCM career field. The research then attempted to determine what relationships existed between these factors and the DCM's effectiveness. The aircraft mission capable (MC) rate was used as a measure of effectiveness for the purposes of this research.

The first portion of the research was accomplished by comparing sample descriptive statistics to the suggested and required experience factors from Air Force Regulations 36-1 and 36-23. The results from this phase of the research show evidence of limited breadth and depth of experience within the DCM career field.

The second part of the research utilized contingency table analysis and the Chi-square statistic to test for relationships between experience and effectiveness. Results from this portion of the research were inconclusive because the large F probabilities that were obtained. In each contingency table, the F value indicated that the results

could have been obtained purely by chance. Thus, while limited breadth and depth of experience do exist at the DCM level, statistically valid conclusions concerning any relationships between experience and effectiveness could not be drawn. However, an incidental, but interesting, conclusion did arise from the data preparation phase of this portion of the research. Analysis of variance testing which was carried out prior to the contingency table analysis proved that the MC rate is aircraft type dependent.

Recommendations which followed from this research centered on the problems encountered in this effort. The author feels that these problems, which precluded conclusive results, were the result of a small sample and an incomplete measure of effectiveness. Thus, future researchers in this area should utilize a more complete measure of DCM effectiveness and try to obtain a larger sample.

DEPUTY COMMANDER FOR MAINTENANCE
EXPERIENCE AND EFFECTIVENESS: IS THERE A RELATIONSHIP?

I. Introduction

Background

> Not only has the equipment inventory become dramatically larger and more complex, but also the military forces must be maintained in a higher state of readiness in order to respond in the vastly decreased time available for mobilization (1:VI).

The contemporary military environment, unprecedented in the history of warfare, is characterized by "state of the art" weaponry and global reaction times measured in minutes rather than hours or days. A result of this environment has been the development of a logistics system which is equally complex and without precedent. Modern high technology weapons systems and the complexity of the organization that supports them may demand that the senior logistician be familiar with the total system of logistics. If this is true, today's senior military logistician can no longer be afforded the luxury of concentrating his or her efforts in one segment of a simple system, such as being the best supply officer at the base or the best maintenance officer at the depot. Whether he/she is a supply officer or a logistics planner, a contracting officer or a maintenance officer, the logistician of today may need a general familiarity with the workings of a number of logistics

disciplines. In order to meet this requirement, the logistician may need a base of experience, education, and training which concentrates on general knowledge rather than narrow expertise.

With this concern in mind, Air Force leaders have expressed reservations about the way the Air Force currently prepares officers to fulfill the responsibilities of senior logistics positions. Specifically, Lieutenant General Leo Marquez, Deputy Chief of Staff for Logistics and Engineering, is concerned that the Air Force has created a corps of functional specialists within each logistics career field rather than develop the general managers with an overall knowledge of logistics that appear to be needed.

> . . . For decades, we have managed our people without regard to an end objective. That objective should have been to develop a large core of logistics officers - officers that are able to manage the total logistics system comprised of its many subsystems. Instead what we have done is to "stovepipe" our officers in functions, such as maintenance, supply, or transportation. We failed to recognize that our real product, that of combat sorties, results from the combination and interactions of all these functions . . . Not recognizing that we needed managers instead of maintenance officers or supply officers, these people have reached senior positions unprepared to manage the totality of our complex logistics system (2:10).

Therefore, a basic question must be addressed. Does the Air Force need to restructure the career progression of individuals in the various logistics fields in order to develop senior officers who can cope with all aspects of logistics (3:33)?

Definitions

For the purposes of this research, the following definitions will be used:

1. Military Logistics - "The set of activities which, taken together, constitute a system for creating, supporting, and operating military forces on the battlefield" (4:I-2). It is commonly recognized that this set of activities includes contracting, supply, transportation, and maintenance (5:25).

2. Logistics System - "The interconnected network of logistics functional areas, contracting, supply, transportation, and maintenance, which, through the coordinated efforts of using commands, Air Force Systems Command, separate operating agencies, and Air Force Logistics Command, achieve military logistics" (4:I-2).

3. Stovepiping - The process of career progression which provides an officer with a narrow base of experience in a single logistics functional area (2:10).

4. Insufficient depth of experience - An officer's lack of adequate previous experience in the specific field to which he is presently assigned (6:1).

5. Deputy Commander for Maintenance (DCM)- "The individual officer, normally a colonel, who supervises large consolidated maintenance units and serves as the senior maintenance advisor to commanders and senior Air Staff chiefs" (7:A13-19).

Problem Statement

The Logistics Career Area encompasses the program formulation, policy planning, coordination, inspection, command and direction, and supervision and technical responsibilities pertaining to the Missile Maintenance, Aircraft Maintenance and Munitions, . . . Utilization Fields (7:A13-2).

Since aircraft maintenance is a logistics functional area (5:25) and the Deputy Commander for Maintenance (DCM)

is a senior position (7:A13-19), Lieutenant General Marquez's concerns about the stovepiping of senior logisticians may apply to individuals in this field. That is, current policy may lead to functional specialists filling the position of DCM when general managers with an overall knowledge of the logistics system may be needed. Further, when the reservations of Lieutenant General Marquez are coupled with the implications of a 1978 Maintenance Posture Improvement Program Conference report, an additional question concerning the preparation of DCM's arises. During the 18-19 Oct 78 Air Staff Maintenance Posture Improvement Program (MPIP) Conference, information was provided relating to the experience level of Deputy Commanders for Maintenance and assistants in base aircraft maintenance organizations. The data presented revealed that a substantial number of DCM's and assistants had less experience in the aircraft maintenance career field than was required by MAJCOM and AFMPC standards in the Support Distribution Training Model (SDTM) (6:1).

Thus, it appears that if DCM's are being stovepiped, they may be specializing in other fields before moving to maintenance. The Air Force may be assigning individuals to the DCM position who not only lack the breadth of experience to be general managers of logistics, but also lack the depth of maintenance experience required in their current positions.

In view of this situation and Lieutenant General Marquez's concerns, it seemed prudent to investigate the experience, education, and training histories of those officers currently holding a Deputy Commander for Maintenance AFSC (409X). The purpose of this investigation was to determine if there is evidence for the existence of stovepiping and insufficient depth of experience in this career field. In addition, research appeared to be needed to assess the impact that these conditions may have on the degree of effectiveness achieved by individuals who have held the DCM position.

Scope

While there has been considerable past discussion of career development for logisticians, the specialist versus generalist dichotomy, and the experience factors inherent in successful management, very little empirical research has been done concerning the relationship of experience to effectiveness. In fact, the comprehensive literature review presented in Chapter 2 revealed only three empirical studies on the subject of management development. Furthermore, two of these studies only marginally addressed the variables of interest to this study. Considering the limited nature of previous research, this effort was limited to an exploratory, theory testing effort. In addition, since the wide variability of effectiveness measures among the different

logistics functional areas could lead to unnecessary complications, this research was limited to a target population of aircraft maintenance DCMs. This limitation was intended to reduce the problems that arise when heterogeneous groups are compared.

More specifically, this research effort will focus on testing Lieutenant General Marquez's stovepiping theory (hereafter used interchangeably with limited breadth of experience) and the MPIP Conference theory of limited depth of experience. These theories will be tested in the aircraft maintenance arena only.

Research of this type should help to clarify the career development needs of those who fill the DCM position. This research should also provide a foundation for future investigations which may extend the findings to other logistics career areas. Finally, the research should provide a basis for building an understanding of the experience, education, and training needs of a generalized logistics career development program.

Objectives

The first objective of this research effort was to look for evidence of limited depth and breadth of experience within the DCM career field. This was investigated by comparing the histories of the sample population to the standards contained in Air Force regulations (7:A13-19, 8:23-6 to 23-7).

The second and primary objective of this research was to investigate the relationships between breadth of experience and effectiveness on one hand and depth of experience and effectiveness on the other. Both cases were investigated as they relate to the aircraft maintenance DCM. This research effort attempted to determine the relative importance of these factors, breadth and depth of experience, and their role in the effectiveness eventually displayed by the DCM.

Pursuit of the primary research objective was carried out by testing the following research hypotheses:

1. There is no relationship between the breadth of experience exhibited in an individual DCM's career pattern and his/her demonstrated performance when compared to a standard measure of DCM effectiveness.

2. There is no relationship between a DCM's depth of experience in aircraft maintenance and the degree of effectiveness he/she achieves.

3. There is no interrelationship between breadth of experience and depth of experience which affects the degree of effectiveness achieved by a DCM.

II. Literature Review

> The primary purpose of career management is to ensure that qualified officers are available to take on responsibilities within the defense establishment . . . The Air Force today, because of the increasing technical complexity and sophisticated management needs, requires a formal career development program (8:1-1).

Introduction

The purpose of this chapter is to review literature pertaining to the real or perceived enhancement of the management development process gained from increased breadth and depth of experience. Professor Robert N. Anthony, of the Harvard Graduate School of Business Administration, has shown that the management control processes used by both profit and nonprofit organization are basically similar.

> Most studies of the management control process have been done in business organizations, and most of the new control techniques were developed in these organizations . . . the basic control concepts are the same in both profit oriented and nonprofit organizations . . . (9:1-2)

If the management control process of both profit oriented and nonprofit organizations are essentially the same, then the management development process needs should also be the same. If this is the case, the management development processes used by private industry should be applicable to nonprofit organizations.

Since the Air Force is a nonprofit organization, the thrust of this literature review will be two-fold. First,

the literature relating to management development through increased breadth and depth of experience in private industry will be presented. Then, writings pertaining to the military, particularly the Air Force DCM, will be presented. This may help to clarify the management development needs of the DCM.

Private Industry

Numerous authoritative works in the field of management development identify both breadth and depth of experience as central issues in the preparation of senior managers. Among these, the most comprehensive treatment is presented by George Strauss and Leonard Sales in their book, Personnel: The Human Problems of Management.

In the management development section of their book, Strauss and Sales point out that every organization needs both specialists, who have an extensive depth of experience in a particular job, and generalists, whose breadth of experience gives them adequate knowledge of the entire organization.

> . . . There is a dilemma here. Each boss wants to hire specialists and reward specialization at the lower level, yet each organization wants generalists at higher levels. Where are the specialists to come from (10:500)?

This suggests another question. Where are the generalists to come from?

As a partial answer to the questions posed by this dichotomy, the authors propose three specific methods of

developing top level managers from the initial cadre of management recruits.

Understudies. When using this technique, the manager is required to train his own successor. Then, it is hoped, when the manager moves, the understudy will be fully qualified and ready to assume the responsibilities of the position. Even though this technique has the advantages of being relatively inexpensive and easy to administer, a serious drawback occurs in that it tends to prepare managers who duplicate the knowledge base of their predecessor. If the predecessor was a specialist, the understudy will also tend to be a specialist (10:511).

Systematic Rotation (10:511-513). Many organizations have found that one good way of preparing managers for top level positions is to use a lateral transfer system. In this system, where managers are rotated among numerous jobs at or near the same management level before being promoted, the manager is given a broad base of experience on which to base future strategic decisions (10:511-513).

> . . . one striking characteristic of successful managers is their rapid mobility . . . 'zigzag mobility,' not straight upward progression, seems to be the typical path to success" (10:511).

However, this is done at the expense of expertise in any particular field.

Special Broadening Assignments. Organizations that use this technique identify young, highly qualified low-level managers for special assignments which expose them to top-

level decision making early in their career. Since these assignments are usually part-time or temporary (10:514), the manager is not forced to forego the development of expertise in his specialty in order to attain a broader base of experience. However, since these assignments are usually reserved for the "stars" of an organization, many managers who would benefit from broader experience are excluded (10:514). Thus, the organization forces itself to accept a much more limited pool of potential top managers (10:514).

A comprehensive survey of the literature pertaining to career development, management development, management training, executive training, personnel development, and personnel problems failed to produce any information which was substantially different from that presented in the Strauss and Sales text. Although many peripheral issues such as executive training and education were presented, the techniques for dealing with the depth and breadth of experience did not vary significantly. Furthermore, only three empirical studies pertaining to breadth and depth of experience were found. One of these will be presented in the next section and the other two will be postponed for presentation in the section which covers military literature.

Empirical Studies in Civilian Industry

In the mid 1950s, Robert K. Greenleaf, an executive assigned to Management Development and Management Research at American Telephone and Telegraph (AT&T), commissioned

Douglas W. Bray to design and implement a long-term study which investigated several aspects of management development at AT&T (11:4). These included, but were not limited to, the percentage of managers who rotate jobs to attain a broad base of experience and subsequently are successfully promoted to upper management positions and the percentage of managers who stay within one department, thereby developing expertise, and still attain success as upper-level managers.

A 1974 snapshot of the in-progress study showed that after the first eight years,

> . . . thirty-three percent of those who stayed in their starting department had reached third-level management by the time of reassessment, as compared with thirty-nine percent of those who had changed departments or served with another unit of the Bell System (11:65).

According to Bray, this is, "... a small but insignificant difference" (11:65). Mr. Bray further states that, "The study provides no support for the notion that experience is the best teacher..." (11:186).

Military Literature

> The personnel and material resources used in aircraft maintenance . . . activities demand a high degree of professional competence in career maintenance managers with extensive and varied logistics support backgrounds . . . Maintenance officers are encouraged to broaden into other logistics career fields, for example, Supply (AFSC 64XX), Transportation (AFSC 60XX), Procurement (AFSC 65XX), and Logistics Plans (AFSC 66XX) (8:23-1 to 23-3).

Air Force Regulation (AFR) 36-23 presents a detailed plan of career progression for the maintenance officer which

includes two of the same experience broadening techniques that are used by civilian industry. The use and timing of these techniques, systematic rotation and career broadening assignments, are illustrated in Figures 1A and 1B. The regulation further states that, "The key to development is how well an officer performs in a variety of aircraft maintenance and munitions positions throughout a career" (8:23-1). Thus, it would seem that Air Force personnel managers consider both breadth and depth of experience to be important qualifications for the DCM. However, the regulation does not present any empirical evidence of a link between these facets of experience and effectiveness.

Empirical Studies in Military Literature

In a 1975 Air Command and Staff College research study, Major Charles R. Walker investigated aircraft maintenance DCM productivity. His research used the similarities between Air Force maintenance organizations and private businesses in an attempt to show that a DCM's experience base is an important factor in determining his effectiveness or noneffectiveness. In his study, Major Walker cited a Dunn & Bradstreet report which attributed 91 percent of all business failures to poor management (12:16). He further reported that Dunn & Bradstreet subdivided this poor management into four categories, as shown in Table I.

CAREER PROGRESSION GUIDE—AIRCRAFT MAINTENANCE AND MUNITIONS					
Year	Phase	Grade	PME	Training	Education
—29		Colonel: 6% of authorizations	Refer to AFR 53-8 for residence eligibility. AFR 50-12 for correspondence/seminar eligibility and your Base Education Officer for more information.	See AFR 50-5 for apppropriate courses.	Graduate degree requirements in utilization field. For AFIT eligibility see Base Education Officer for current AFIT program quotas.
—28					
—27				Advanced Technical and Management Courses	
—26					
—25					
—24			National War College (Residence) Industrial College of Armed Forces (Residence and Correspondence). Other Services Senior School (Residence). Air War College (Correspondence, Seminar, Residence).		
—23					
—22				-Aerospace Maint Staff Officer Course (30AR4011)	
—21		Lieutenant Colonel: 18% of authorization			
—20				-Aircraft Maint for Munitions Officer Course	
—19					
—18				-Munitions for Aircraft Maint Officer Course	
—17					Masters Degree in Logistics Management, Systems Management or related areas
—16		Maint 22% of authorization		-Aircraft Maint Officer Course (Accelerated)	
—15					
—14				-Logistics Management Courses (AFIT short courses)	
—13			Armed Forces Staff College (Residence). Other Services Intermediate Service School (Residence). Air Command and Staff College (Seminar, Correspondence, Residence).		
—12				-Field Training Detachment Courses -weapon systems courses -base level management courses -maint management courses	
—11					
—10		Captain-AFSC 4024: 35% of authorizations; AFSC 4054: 12% of authorizations			
— 9					
— 8					
— 7				-Aerospace Munitions Officer Course	
— 6			Squadron Officer School (Residence and Correspondence)		
— 5				-Aircraft Maintenance Officer Course	Bachelors Degree, preferably in Engineering, Management, or the Sciences
— 4					
— 3		Lieutenant-AFSC 4054: 2% of authorizations; AFSC 4024: 5% of authorizations			
— 2					
— 1					

(8:23-6)

Figure 1A. Maintenance Officer Career Progression

CAREER PROGRESSION GUIDE—AIRCRAFT MAINTENANCE AND MUNITIONS (Continued)		
Assignments	**Optimum Phase Points**	**Year**
Officers will occup key managerial positions at all levels of command, including: -Deputy Commander for Maintenance -Director of Munitions -Director of Maintenance Engineering	Professional maintenance officer transitions into AFLC/Air Staff/ MAJCOM/NAF positions Some professional maintenance officers will serve in DCM duties at unit level	29— 28— 27— 26— 25— 24— 23—
Career Maintenance Officers: -Director of Maintenance/Munitions -Deputy Commander for Maintenance -Maintenance Squadron Commander -Maintenance Staff Officer/Inspector -Maintenance Control Officer -Munitions Supply Sq/CC or Aviation Depot Sq/CC -Emphasis on key positions demanding extensive unit level experience Rated Supplement Officers: -Minimal numbers unless on second assignment in 40XX -Positions of responsibility based on experience, training, and background	Assistant DCM or squadron commander Maintenance Control Officer Major Command Division Chief	22— 21— 20— 19— 18— 17— 16— 15— 14—
Career Maintenance Officers: -Maintenance Squadron Commander at late stages of this phase -Maintenance Supervisor -MAJCOM/NAF staff officer -Air Logistics Center Staff Officer -Career Broadening in ROTC, OTS, Logistics AFSCs -Instructor Duty at Chanute/Lowry, etc Rated Supplement/Career Broadening Officers: -Flightline, sortie production duties	A few highly qualified officers selected for squadron commander positions Possible career broadening	13— 12— 11— 10— 9 — 8 —
Career Maintenance Officers -MAJCOM/NAF Staff Officer in late stages of this phase -Continue at base level with duty as maintenance supervisor and DCM staff -Crossflow into maintenance or munitions -Rotation thru various maint functional areas Rated Supplement/Career Broadening Officers -Flightline, sortie production duties	Completed MAJCOM/NAF staff AFIT Selection EWI Selection ASTRA Nomination	7 — 6 — 5 — 4 — 3 — 2 —
Upon completion of basic Maintenance/Munitions Course assigned to unit level maintenance Rotate among various maintenance squadrons after achieving full qualification in initial AFSC. Initial squadron assignments should present opportunities for officer to serve in all major branches of the squadron.	Rotated through as many maintenance jobs as possible to establish strong background in as many facets of unit level maintenance as possible.	1 —

(8:23-7)

Figure 1B. Maintenance Officer Career Progression

TABLE I

Dunn & Bradstreet Data

	Category	Percent of Failures
1.	managerial incompetence	44
2.	unbalanced management experience	20
3.	lack of management experience	17
4.	accomplished managers transferring to businesses in which they have no previous experience	10

(12:17-19)

Using the Dunn & Bradstreet categories as a basis for his study and using only six cases of DCM success or failure, Major Walker concluded that, "the single greatest factor attributed to their (DCM) failure was lack of maintenance experience" (12:31,32). It should be noted that Major Walker based his measure of success on higher headquarters inspection reports.

The categories which the Dunn & Bradstreet report labels "unbalanced management experience" and "lack of management experience" are particularly relevant to this research effort since, according to Major Walker's definitions of these terms, they are synonymous with insufficient breadth and depth of experience, respectively (12:18). If, after substituting terms, one accepts Major Walker's premise that the maintenance organization is much like a large pri-

vate business, it becomes tempting to draw the conclusion that limited depth of maintenance experience and, possibly, limited breadth of logistics experience lead to poor performance as a DCM. However, since Major Walker used a case study method of research, which necessarily limited his sample population, supporting studies are needed before any meaningful generalizations can be made.

A thorough review of the literature uncovered only one other paper on this subject, an Air Force Military Personnel Center survey titled "Project Broadlook." While this study did not address breadth of experience, it did tend to support Major Walker's conclusions by stating that "commanders and line personnel agreed that previous maintenance experience was the most important factor" (13:41) in selecting a successful Deputy Commander for Maintenance.

Summary

Articles, research studies, and books related to this research were identified through literature searches of the Defense Technical Information Center, the Air Force Institute of Technology and the Wright State University Libraries. The keywords and terms searched included: training, DCM, DCM training, effectiveness, experience, success, aircraft, maintenance, aircraft maintenance, aircraft maintenance training, logistics, logistics training, logistics management, management, management training, and executive training. Of these, the key words experience,

executive training, and DCM training provided the most applicable literature.

After reviewing over 100 sources identified by these searches, the articles referenced in this chapter were the only ones found to be of direct value to this research. Others were either unrelated or they duplicated the material presented here. Thus, literature which was relevant to the subject of experience as a determinant of effectiveness was found to be rare.

Even so, this chapter provides ample evidence that both civilian and military planners consider breadth and depth of experience to be important components of successful career development and progression. However, the empirical evidence for this relationship is sometimes contradictory.

The AT&T study found no evidence of a relationship between experience and success. In fact, it supports all of the hypotheses presented in this research effort. By inference then, it lends little credence to the theories being tested here. Major Walker's study, on the other hand, tended to support those that believe that there is an important positive relationship between the two. This situation, coupled with the scarce nature of relevant literature, emphasizes the need for further research.

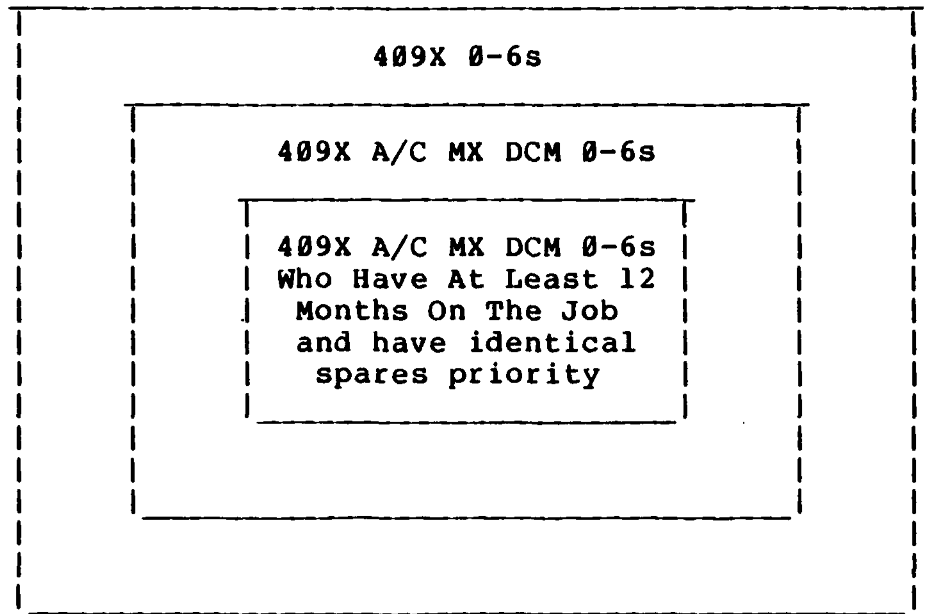
III. Methodology

Introduction

This chapter addresses the design and methodology of the research effort. More specifically, it defines the population, the sample, the relevant variables, and the measure of effectiveness used here. Also, it explains the data collection plan, the method of analysis, the assumptions, and the limitations.

Population/Sample

Population Description. The population of interest for this research (see Figure 2) consists of all active duty colonels (0-6), AFSC 409X, who have held the position of Aircraft Maintenance DCM at some point in their career. In addition, since the time actually served in a position can have a significant effect on performance, the population was restricted to only those DCM's who had served at least 12 months in the position. When a DCM had more than 12 months in the position, only the last 12 were considered. Further, only DCMs who possessed identical spare parts priority were included in the analysis. Spares priority was determined by examination of the Force Activity Designator (FAD) possessed by each unit. Only those units with an overall FAD of III were included (14:24-4 to 24-6).



(15:11)

Figure 2. Target Population

These restrictions were intended to ensure that the research measured the performance of the DCM and not his/her predecessor, and that advantages or disadvantages due to availability of spares were reduced.

<u>Sample</u>. There were approximately 167 individuals in the 409X Aircraft Maintenance DCM population before the addition of the inclusion criteria. Since these restrictions further reduced the population to 58 individuals, a sample, in the normal sense of the word, was not taken. Rather, in the interest of increased validity, all individuals who met the inclusion criteria were analyzed. All sample DCMs held the position for the required 12 month interval within the time period from June of 1979 to February of 1985.

It should be noted that because the research encompassed a number of years, some aircraft wings were studied more than once. This happened when DCMs who met all inclusion criteria were assigned to the same aircraft wing during different time periods

<u>Sample Validity</u>. In order to ensure that the inclusion rules did not bias the test sample, a random sample of 20 percent of the entire population was examined. After this sample was obtained by selecting every fifth DCM, it was compared to the test sample using the large-sample Z test (16:283-284). This procedure was repeated for each independent variable which manifested a normal distribution. In

each case there was insufficient evidence to reject the null hypothesis:

$$U_1 - U_2 = 0$$

Since there is no standard test for non-normal distributions, these results were accepted as evidence that sample bias was not present (16:283-284). Thus, the test sample is considered to be representative.

Variables

Dependent Variable. Although it is understood that a single measure which encompasses all the aspects of effectiveness is unlikely, the MC rate was used for this initial research effort. This rate was selected because it is readily available, universally accepted, and required by regulation (17:2-14 to 2-16). Additionally, conversations with MAJCOM personnel confirmed that the MC rate is examined when evaluating DCM effectiveness (18; 19; 20; 21).

Independent Variables. The relationships of interest to this research, those of breadth and depth of experience to effectiveness, were defined by seven variables. The dependent variable Y, effectiveness, was expressed by the MC rate. Breadth of experience was expressed by the independent variables X_1, X_2, and X_3.

X_1 - showed the number of assignments that a particular DCM had in other logistics career fields.

X_2 - represented the total number of months served in those jobs.

X_3 - showed the number of different levels of logistics assignments, within the Air Force chain of command, to which the individual had been assigned, for example, unit, wing, air division, etc.

These breadth of experience variables were used to find evidence of stovepiping and to test Hypotheses One and Three. The lack of breadth would indicate a stovepiped individual.

Depth of experience was also expressed by three independent variables.

X_4 - showed the number of other maintenance jobs that a DCM had held.

X_5 - represented the total number of months spent in all other maintenance jobs, and

X_6 - showed the number of levels of assignment.

The above listed variables were used to search for evidence of limited depth of experience and to test Hypotheses Two and Three. However, they were also used to look for evidence of stovepiping. This was possible because an individual who possesses a relatively high depth of experience is more likely, due to time constraints, to be a stovepiped individual.

In addition to the breadth and depth of experience factors, AFR 36-23 lists other factors which are considered important to the overall development of the DCM (8:23-6). (See Figures 1A and 1B.) Failure to incorporate these factors in this research would, at the very least, lead to incomplete research and it could, possibly, lead to inaccu-

rate results. Therefore, variables corresponding to required and suggested technical schools, PME, PCE, and formal education for each phase point in an officer's career were added to the research design. The individual variables and explanations of each follow:

X_7 - The number of logistics technical schools completed.

X_8 - The formal educational level of an officer.

X_9 - The total number of PME completed, and

X_{10} - The number of PCE courses completed.

Finally, the Officer Career Progression Guide uses total years of commissioned military service as the underlying basis for career development (8:23-7). Therefore, a final independent variable, X_{11}, was added to account for any relationship that may occur in this domain.

The initial research design included the development of of a regression model of all variables, Y through X_{11}. That model would have been of the following format:

$$Y_i = A + B_1 X_1 + B_2 X_2 + B_3 X_3 + B_4 X_4 + B_5 X_5 + B_6 X_6 + B_7 X_7 + B_8 X_8 + B_9 X_9 + B_{10} X_{10} + B_{11} X_{11}$$

"...where

Y_i is the estimated value of the dependent variable Y,

B_i is a constant by which all values of the independent variable X_i are multiplied, and

A is a constant which is added to each case" (22:323).

However, the small actual sample size precluded this effort (23:446-447). As a result, contingency table

analysis was used to test for the relationships of interest.

Intervening Variables. The complexity of the Air Force mission makes the elimination of confounding variables difficult, if not impossible. For example, the varied Air Force missions require the maintenance of many different types of aircraft (MDS), each with it's own maintenance char-acteristics. The global mission of the Air Force requires that these aircraft be stationed in many different environ-ments. Each of these environments, whether it be hot or cold, wet or dry, puts different strains on men and equip-ment. Finally, as the mission of the Air Force evolves over time, maintenance policy and program changes can cause tre-mendous fluctuations in the MC rate. Any one or a combina-tion of these factors could affect aircraft condition statistics in such a way as to make meaningful analysis extremely difficult.

The combined effects of these factors may force the sample into subgroups which are faced with MAJCOM, time period, and MDS unique management problems. A result may be that generalization to the population as a whole may be as inappropriate as it is inaccurate. This possibility was investigated in the following manner.

Initially, the sample was partitioned into subgroups. These subgroups were defined in a manner which tended to neutralize the influence of the confounding variables. That is, since overseas MAJCOMs tend to operate in vastly dif-

ferent geographic and climatic regions, only DCMs serving in the stateside (CONUS) MAJCOMs were included in the analysis. Furthermore, since different MAJCOMs do follow different management practices, the individuals must have served in the same CONUS MAJCOM during their tenure as DCM in order to qualify for a subgroup. Likewise, only DCMs who are or were responsible for the same type of aircraft, F15, F4, B52, C5, etc., were initially grouped together. The time period problem was alleviated by avoiding those periods when major changes in maintenance practices or management procedures are known to have occurred. Thus, each subgroup was defined by MAJCOM and aircraft type.

Once the subgroups were formed, they were tested for statistically significant differences and coded according to the results. An explanation of the techniques used for testing and coding is contained in the next section. The purpose behind this procedure was to allow generalization to the entire population by removing the limiting effect of small subgroups.

Data Collection Plan

The supporting data for this research was gathered from two Air Force data bases. The Air Force Military Personnel Center Atlas data base provided personnel histories on DCMs. These histories included previous assignments and the inclusive dates, the highest educational level attained and the degree major, the number of Professional Military Education

(PME) courses completed, and the number of Professional Continuing Education (PCE) courses completed. Data was gathered by data base personnel following receipt of a written request from the researcher.

Data on the MC rate achieved by each DCM was gathered from the data base maintained by the Maintenance Analysis Division of the LGM Directorate at each MAJCOM. This data is reported to the MAJCOM by each unit on a daily basis. Further, it is recorded and maintained within the data base by unit and by month. Thus, accurate and timely data was easily obtained by telephone request.

Once the personnel histories and MC data were obtained, a 12 month simple average of MC rates was matched to each sample DCM. In each case, the last 12 months of a DCM's tenure was used for this computation.

Measure of Effectiveness

Before an attempt could be made to determine what, if any, relationship exists between experience and effectiveness, a common measure of effectiveness had to be found. Given that the population is distributed throughout the entire Air Force, the measure had to be relevant across all major commands (MAJCOM) if valid generalizations were to be made. Furthermore, the measure had to be directly related to the duties and responsibilities of the Deputy Commander for Maintenance (DCM).

All MAJCOMs track various maintenance and equipment

performance statistics called key indicators. These statistics are reported by each unit to the MAJCOM on a daily basis and to Headquarters Air Force twice monthly (17:2-1). Once received, they are used by the MAJCOM Director of Logistics Management (LGM) and the Air Staff in evaluating the performance of individual maintenance organizations (17:2-1; 18; 19; 20; 21). Thus, one could logically assume that one or a combination of these key indicators might provide a reasonable measure of the DCM's effectiveness.

An analysis of these key indicators revealed two trends. First, all MAJCOMs evaluated performance based on the aircraft condition statistics required by regulation (17:2-12 to 2-15). Second, there was a tendency for MAJCOMs to supplement Air Force Regulation (AFR) 65-110 required statistics with command unique key indicators (24:3-2; 25:5; 26:A2-2 to A2-3). For instance, Tactical Air Command (TAC) tracks sorties flown by a unit against the total number of sorties required of that unit. Military Airlift Command (MAC) and Strategic Air Command (SAC), on the other hand, track the percentage of total take-offs which occur on time. MAC refers to this key indicator as the logistics reliability of the unit and distinguishes between home station and enroute logistics reliability. SAC, on the other hand, simply refers to this indicator as on-time take-offs and makes no distinction between home station and enroute

statistics. Although all of these examples of MAJCOM unique key indicators attempt to measure the same thing, aircraft scheduling effectiveness, the differences in the way they are computed cause problems with universal applicability.

In an attempt to find common measures of effectiveness for all MAJCOMs, informal telephone interviews were conducted with personnel at the office of each stateside MAJCOM LGM. In each case the individuals were asked which of the key indicators were most important in determining the effectiveness of a maintenance unit and the DCM. The individuals were also asked to rank these indicators in order of importance and provide a weighting factor for that importance. Results of this survey are shown in Table II.

TABLE II

Effectiveness Measures

MAJCOM	INDICATOR #1	INDICATOR #2
TAC	Mission Capable Rate	Aircraft Scheduling Effectiveness
SAC	Fully Mission Capable Rate	Logistics Reliability
MAC	On Time Take-Offs	Fully Mission Capable Rate
ATC	Fully Mission Capable Rate	Percentage of Required Student and Instructor Training Accomplished

(18; 19; 20; 21)

In each case, two indicators were identified and ranked

as to their importance in determining effectiveness. However, the individuals contacted were unanimous in their reluctance to provide a weighting factor. The reason given for this reluctance was the perceived subjectivity of such a factor.

Due to the absence of a weighting factor, the idea of a combined measure of effectiveness was discarded as a viable alternative. Thus, the task became one of selecting a single measure which accounts for DCM effectiveness and is applicable throughout all MAJCOMs.

AFR 66-1, under the heading of Deputy Commander for Maintenance Responsibilities, states that, "The DCM will maximize equipment condition and maintenance readiness, and advise the wing commander of maintenance capability to perform mission requirements" (27:15). Further, the regulation charges the DCM with the specific responsibility for mission equipment (aircraft) condition (27:15). AFR 66-1 is an Air Force regulation which applies equally to all commands. Therefore, it seems reasonable to assume that a statistic which measures the DCM's ability to fulfill the above stated responsibilities might be an appropriate measure of DCM effectiveness. The fully mission capable (FMC) rate is one such measure.

The FMC rate measures the percentage of total possessed hours that a unit's aircraft are fully capable of performing all parts of the unit's mission. In other words, the FMC

rate is a measure of the condition of a particular unit's equipment. Therefore, it is directly related to the DCM's responsibilities. Furthermore, the FMC rate was ranked as the first or second most important of the maintenance key indicators by personnel in three of four MAJCOMs. Thus, this indicator was initially selected as the measure of effectiveness for use in this research effort.

However, after the FMC data was collected and examined, it became apparent that the FMC rate was not a suitable measure of DCM effectiveness. There are two reasons for this conclusion. First, since the Air Force-wide standard for the FMC rate was abolished in the early 1970's, the individual commands have evolved different techniques for managing the condition of their respective aircraft (24; 25; 26). Some, such as Tactical Air Command, place great emphasis on the FMC rate as a management tool. Others place little, if any, emphasis on the FMC rate. Figure 3 illustrates the variation in FMC rates between commands.

The second reason for discarding the FMC rate as an effectiveness measure was the wide variance of the FMC rates of aircraft within today's fleet. Factors such as differences in mission, shortages of spares, and new technology, interact to cause FMC rates to vary from one aircraft type to another. Figure 4 illustrates the FMC rate variation between different types of aircraft.

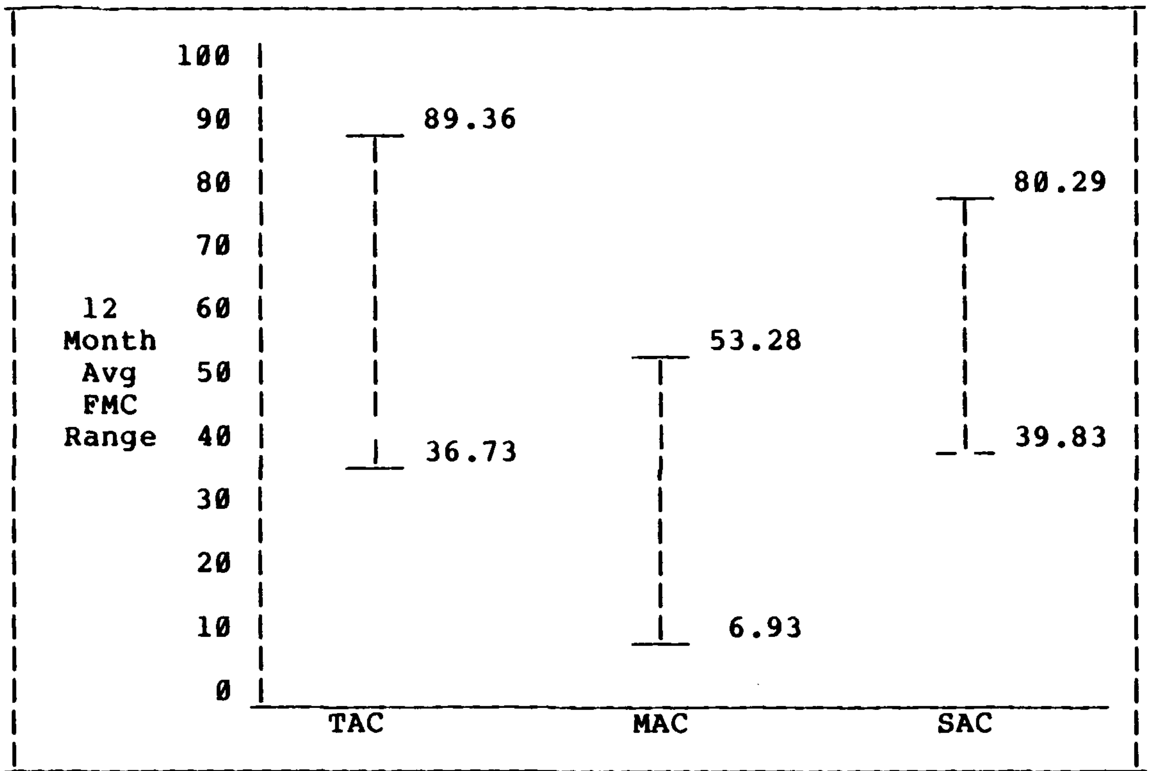


Figure 3. Fully Mission Capable Rate by MAJCOM

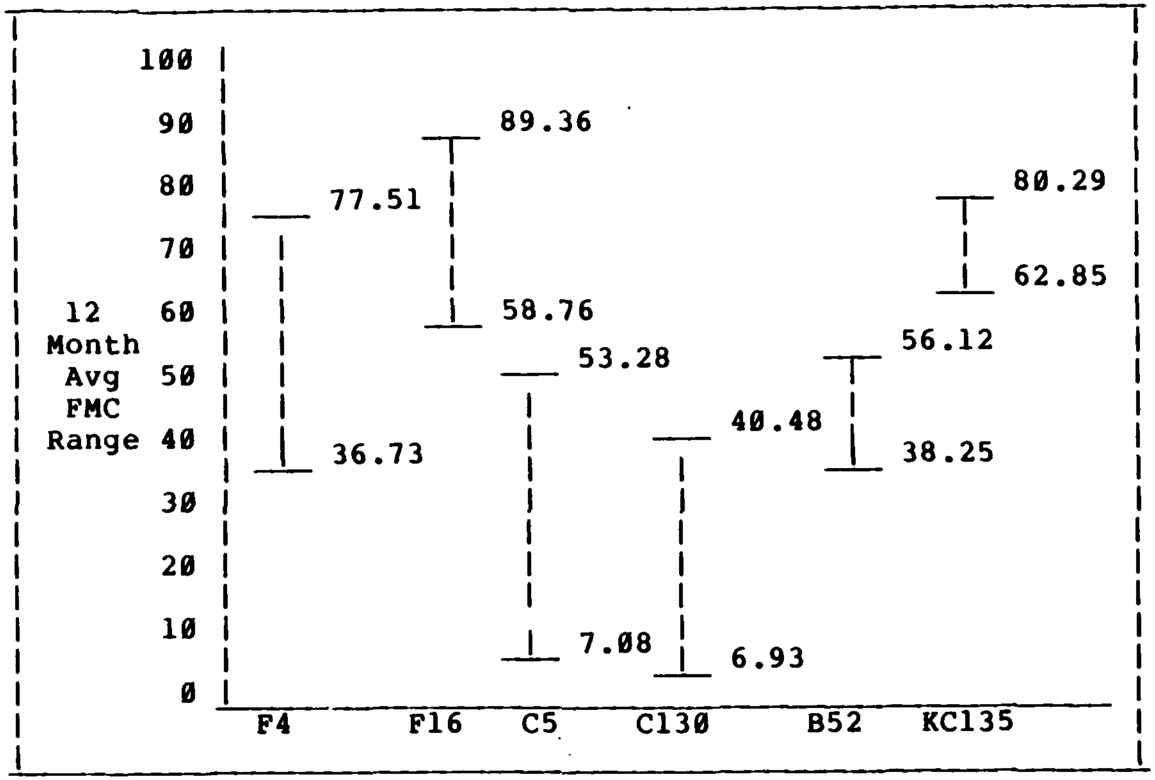


Figure 4. Fully Mission Capable Rate by Aircraft

The combined effect of these reasons is to cause wide variations in the FMC rate that a DCM can achieve. Thus, the FMC rate tends to lose its applicability across MAJCOMs and between different types of aircraft.

After a thorough inspection of all AFR 65-110 required and command unique key indicators, the mission capable (MC) rate was selected as the measure of DCM effectiveness for this research. The primary reason for this selection is that the MC rate, though variable, seems to be less susceptable to the wide fluctuations that affect the FMC rate. See Figures 5 and 6. This, in turn, seems to be the result of the inclusion of the Partially Mission Capable (PMC) rate in the calculation of the MC rate. Figure 7 illustrates the logic flow used in FMC, PMC, and MC determination.

The MC rate measures both PMC and FMC aircraft. Thus, since all flyable and at least partially effective aircraft are either PMC or FMC, they are included in the MC rate. A DCM whose unit possesses older aircraft may not have the resources necessary to maintain a high FMC rate, but he/she may be fulfilling the mission by providing some PMC aircraft to operations. The FMC rate would not reflect this while the MC rate would. Further, recognition of this situation by MAJCOM personnel should lead to a shift of emphasis from FMC to MC in those commands which possess a high percentage of older aircraft. Inspection of MC versus FMC data (see Figures 3,4,5, and 6) supports these conclusions.

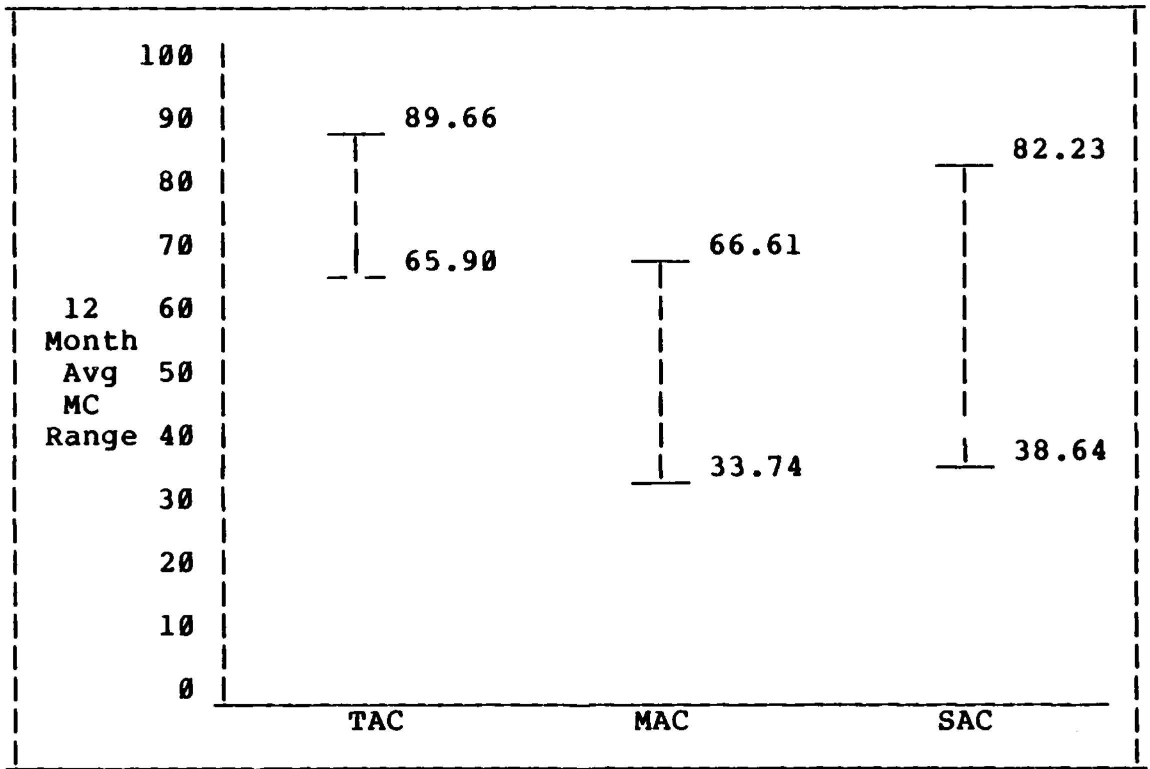


Figure 5. Mission Capable Rate by MAJCOM

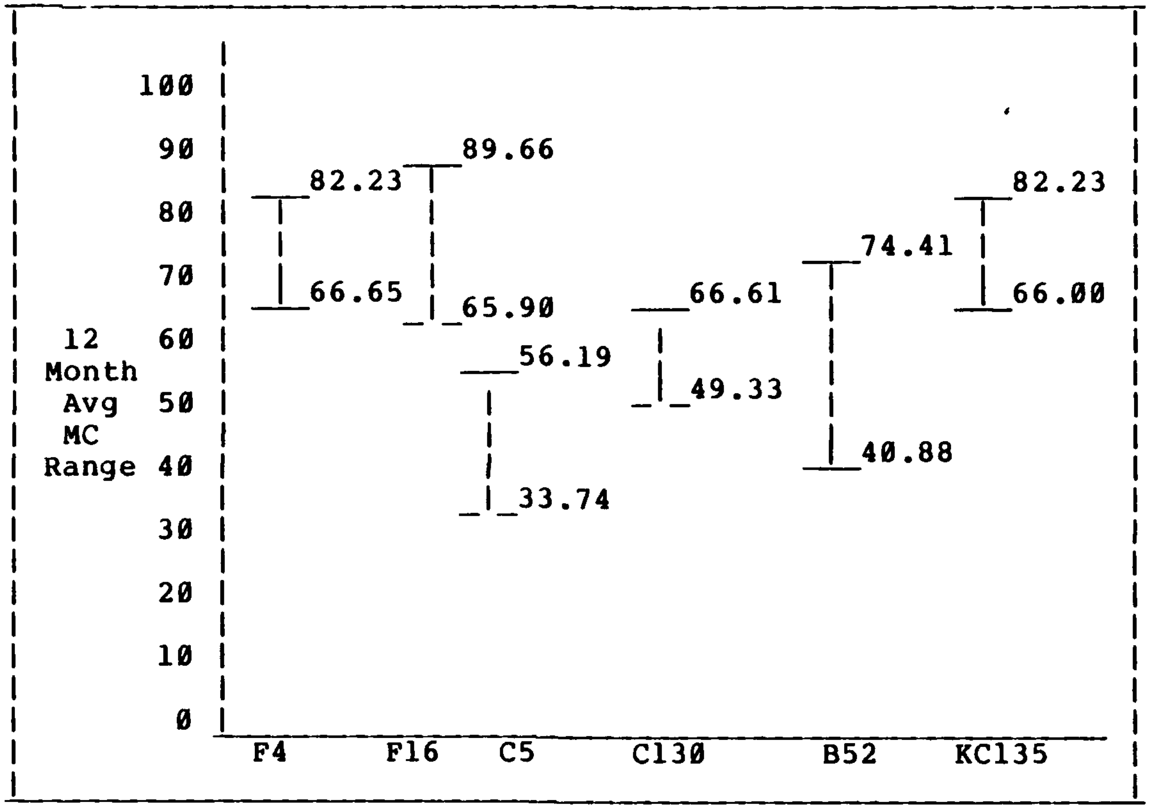
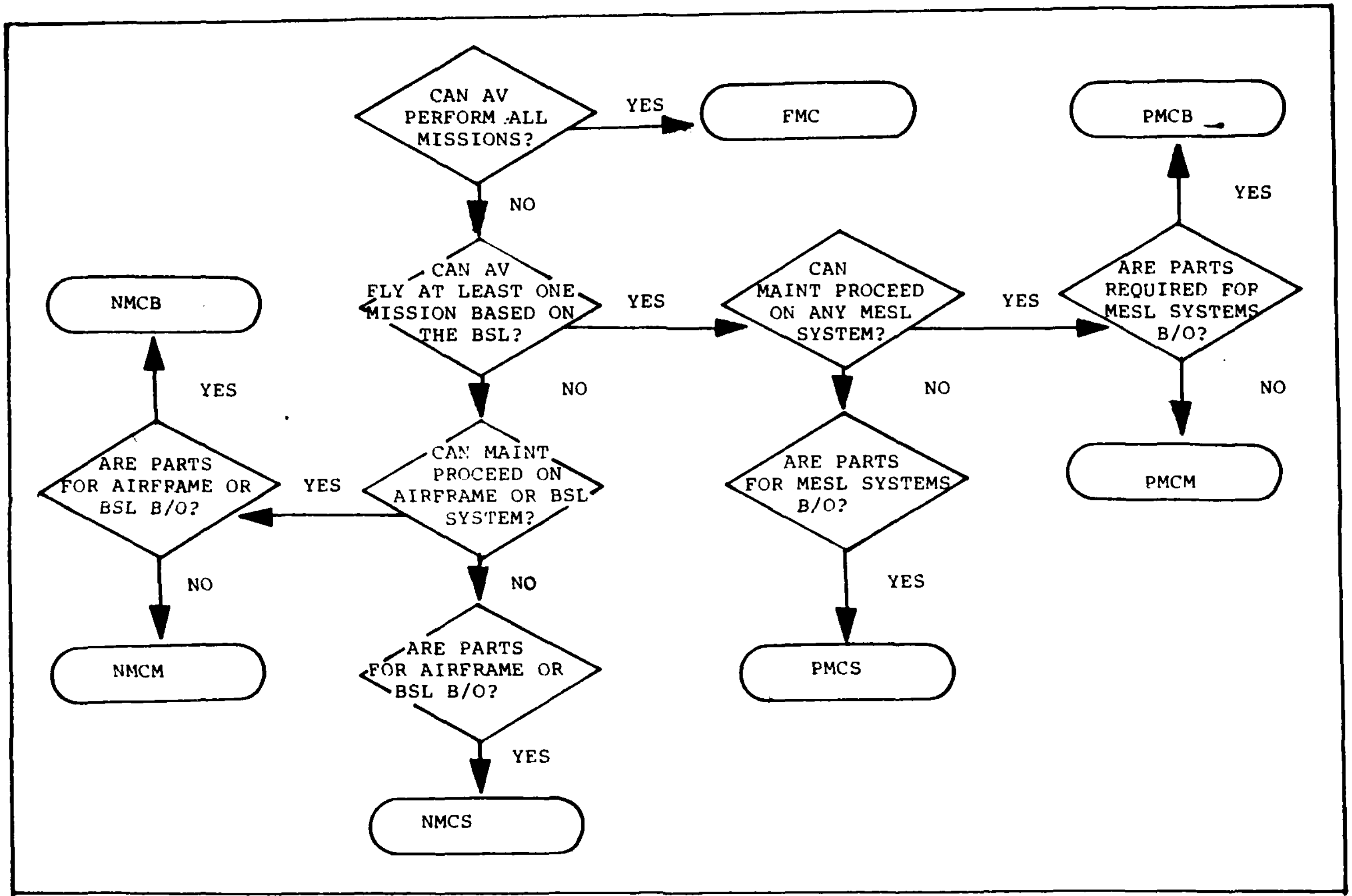


Figure 6. Mission Capable Rate by Aircraft



(14:2-15)

Figure 7. Condition Status Decision Flow

Thus, for the purposes of this research, the MC rate was selected as the measure of DCM effectiveness. More specifically, the DCM's effectiveness was measured by comparing his or her 12 month average MC rate to the MC rate achieved by other DCMs in the sample population.

Method of Analysis

The first objective of this research effort was to determine if limited depth and breadth of experience exist within the DCM career field. The method selected for accomplishing this task was to compare the sample population descriptive statistics to the required and suggested experience levels which are listed in AFR 36-1 (7:A13-19) and AFR 36-23 (8:23-6 to 23-7). For example, the mean commissioned service time of the DCMs in the sample population was compared to the number of years of commissioned service suggested by AFR 36-23. In addition, attempts were made to compare the sample population statistics to the guidelines contained in the Support Distribution Training Model (SDTM) (6:1). However, all attempts to locate the SDTM were unsuccessful. Results for this phase of the research are presented in Chapter 4.

The second and primary purpose of this research was to analyze the relationship between the dependent variable, effectiveness as measured by the MC rate, and the independent variables associated with breadth and depth of experience. As such, a technique which would support this type of

analysis was needed. Initially, multiple regression seemed to satisfy this requirement (22:321). However, this technique proved unsuitable because of the small sample size and even smaller number of individuals included in each of the sample subgroups. Multiple regression requires at least 100 observations before statistically reliable conclusions can be drawn (23:446-447). Since there were only 167 individuals in the total population and the inclusion rules reduced these to 58, multiple regression was discarded as inappropriate. Thus, a different technique was needed.

Due to the small sample size, the contingency table method of testing for association was selected as the analysis tool. The Chi-square test for statistical significance and the F-test were used as the measures of association (22:218-248). The reasons for these and all other statistical tool selections were applicability to small sample sizes and general acceptance in social research (22:218).

Since the contingency table method of analysis can only be used "if fewer than 20 percent of the cells have an expected frequency of less than 5 and no cell has an expected frequency of less than 1 (28:201)", there was a need to remove the limiting effect of the small sample subgroups. This was done by performing one way analysis of variance (ANOVA) at an alpha level of .05 on the MC data and then normalizing the sample according to the results. Two separate ANOVAs were completed. The first tested MC by

MAJCOM and the second tested MC by aircraft type. In both cases, Duncan's multiple range test and the least significant difference (LSD) test were used as the test statistics. LSD was used because it is exact for unequal group sizes (22:427-428). The Duncan's test was used as a backup to guard against the possibility of error.

Once the ANOVAs were completed, MC data for each significant subgroup was normalized about the respective subgroup MC rate mean. This was accomplished by using a zero-one binary code to represent a new variable, effectiveness. ANOVA results are reported in Chapter 4. Raw and normalized data are presented in Appendices A and B, respectively.

It should be noted that since normalization for the MC data was necessary, the previously cited wide variance of FMC data became a moot point. That is, FMC data could have been used for this research. However, because the MC data includes all flyable (FMC + PMC), aircraft a decision was made to continue the research using the MC rate.

Data on all remaining variables, except X_5, was encoded using a zero-one binary code. The spread of the data on the X_5 variable dictated a slightly different coding scheme. Specific coding plans for all variables, X_1 through X_{11}, are as shown below.

X_1 - Individuals who had been assigned to another logistics career field were assigned a one. The variable was set equal to zero if the DCM had not had one of these assignments.

X_2 - Those who had more than 12 months experience in another logistics career field were assigned a one. Twelve or less months of experience earned a zero.

X_3 - This variable was not analyzed separately since, by the nature of sample, it duplicated the information contained in X_1. More specifically, all coding schemes led to a duplication of the codes assigned to the X_1 variable. Thus, any relationship found on X_1 will apply to X_3.

X_4 - Data was encoded for this variable, maintenance jobs, by assigning a one to all values that were equal to or greater than the mean for the sample. The mean was 3.8 rounded up to 4. All values less than four were assigned a zero.

X_5 - The coding scheme used here was:
less than or equal 24 months of experience=1
25 through 48 months=2
49 through 72 months=3
73 through 96 months=4
greater than or equal to 97 months=5

X_6 - Data points for the levels of maintenance were assigned a zero if the value was less than the mean of 2.56 rounded up to 3. All data points that were greater than or equal to the mean were assigned a one.

X_7 - Those DCMs who had completed at least one logistics technical school were assigned a one. All who had none were assigned a zero.

X_8 - Individuals who had completed a master's degree or higher were assigned a one. Any level of formal education below a master's degree was assigned a zero.

X_9 - Data points corresponding to three or more PME courses completed were assigned a one. All others were set equal to zero.

X_{10} - The logistics related PCE course completions for each DCM were encoded by assigning a one to all data points that were equal to or greater than the sample mean of 2.26 rounded up to 3. All data points with a value of two or less were assigned a zero.

X_{11} - All DCMs whose total commissioned service time was greater than or equal to the sample mean of 24.81 rounded up to 25 were assigned a one. All others were set equal to zero.

Raw and coded data are included in Appendices 4 and 5, respectively.

After normalization and data coding, the data corresponding to each of the independent variables was subjected to contingency table analysis at an alpha level of .05. The purpose was to determine whether any statistically significant relationship existed between the individual variables and effectiveness. Results of these tests were then used as the basis for accepting or rejecting the corresponding research hypotheses which were proposed in the first chapter.

Hypothesis 1: There is no relationship between the breadth of experience exhibited in an individual DCM's career pattern and his/her demonstrated performance when compared to a standard measure of DCM effectiveness. (X_1, X_2, X_3)

Hypothesis 2: There is no relationship between a DCM's depth of experience in aircraft maintenance and the degree of effectiveness he/she achieves. (X_4, X_5, X_6)

Hypothesis 3: There is no interrelationship between breadth and depth of experience which affects the degree of effectiveness achieved by a DCM. (X_1, X_2, X_3, X_4, X_5, X_6)

More specifically, large values of Chi-square accompanied by small F values were interpreted as evidence of a relationship between the variables of interest. Conversely, small values of Chi-square accompanied by small F values indicated no relationship. Finally, large values of F indicated purely chance results and inconclusiveness (22:224).

Testing was accomplished by subjecting the data to the Statistical Package for the Social Sciences (SPSS) computer program which is incorporated into the software base of the Air Force Institute of Technology's Harris 800 computer. The specific program coding used for this analysis is reproduced in Appendix C.

Assumptions

The basic assumptions of this study are inherent to any type of causal research. The assumptions are:

1. The variables relating to the number of previous jobs (X_1 & X_4), months spent in those jobs (X_2 & X_5), and the number of levels of assignment in those jobs (X_3 & X_6) adequately describe an individuals experience base.

2. The data bases utilized for this research provided accurate and current information as of February 1985.

3. The dependent variable, an average of the DCM's last 12 month's MC rate, is adequate to represent his/her effectiveness.

4. The comparison of MC rates from different time periods is valid except where major changes in maintenance policies occurred.

5. Assumption Four holds when the different time period MC rates are from the same aircraft wing. That is, an aircraft wing's MC rates can be compared over time when the DCM has changed.

6. The minimum of 12 months DCM experience and MC data which was used to eliminate seasonal and predecessor effects was adequate for the purposes of this research.

Limitations

It is hoped that this research will provide a foundation for understanding the relationship between experience and effectiveness in all logistics career fields. However, the following limitations may impact that global understanding:

1. This research only analyzes the aircraft maintenance DCM career field. Therefore, any conclusions that are drawn from this study apply only to the aircraft maintenance DCM.

2. The data base which provided the MC rate data only provides reliable historical data back to 1977. (DCMs were analyzed for the period from 1979 to 1985 because of inclusion criteria.)

3. The Atlas data base was accessed for personnel histories on active duty individuals only. DCMs who served in the relevant time frame, but had since retired were not considered. In addition, any O-6 DCM who was promoted to O-7 during the relevant time frame was not considered.

4. All possible types of aircraft were not included because their numbers were too small, given the time periods and inclusion criteria, to allow statistically reliable testing. This was true even after data normalization.

IV. Findings & Analysis

Introduction

This chapter presents the results obtained in the research effort. After describing the test sample in more detail, the results of the descriptive analysis for evidence of limited depth and breadth of experience are listed. Further, results of the analysis of variance testing (ANOVA) are reported and explained. Finally, the contingency table analysis results are reported.

Sample

The sample consisted of 58 individuals, from three continental United States (CONUS) MAJCOMs, who were responsible for the maintenance of six different types of aircraft. The breakdown was as follows:

> TAC was represented by 14 DCMs. Eight of these individuals served in F-4 wings while six served on F-16 aircraft.
>
> The sample from MAC consisted of 16 individuals. Seven came from C-5 wings and nine were from C-130 wings.
>
> SAC was represented by 28 DCMs. These 28 were divided evenly between individuals who were responsible for either B-52 or KC-135 aircraft.
>
> Sample demographics are summarized in Tables III.

TABLE III

Sample Demographics

Major Air Command	Aircraft Type	Frequency	Percentage
TAC		14	24.14
	F4	8	13.79
	F16	6	10.34
MAC		16	27.59
	C5	7	12.07
	C130	9	15.52
SAC		28	48.28
	B52	14	24.14
	KC135	14	24.14

Additionally, the aeronautical rating of the sample DCMs, a by-product of the data collection effort, was as indicated below:

Pilots constituted 41 percent of the sample.

Navigators made up 29 percent and

30 percent were not rated.

Research Objective One: Descriptive Analysis

The first objective of this research was to determine if there was evidence of limited depth and breadth of experience within sample population. This section presents the results of the analysis and the findings for this area of the research. In addition, Appendix E contains descriptive histograms for all variables.

Breadth of Experience. The regulations which govern career management within the aircraft maintenance utilization field do not quantify breadth of experience requirements for

the DCM. However, AFR 36-23 states: "Knowledge is mandatory of . . . operational policies and procedures of all material functions as they relate to aerospace maintenance" (7:A23-3). Further, AFR 36-1 suggests that officers who aspire to a 4096 position should become fully qualified in another logistics career area (8:23-5). Maintenance, supply, and transportation require 18 months of experience for entry level full qualification while contracting requires 12 months of experience (7:A13-16, A17-6, A17-21, A17-27, A17-29).

Analysis of the population with respect to the breadth of experience variables X_1, X_2, and X_3 showed that 17 of 58, or 29.3 percent of the sample, had ever had an assignment in another logistics discipline (X_1). Four of these had held more than one other logistics job (X_1). Furthermore, only one of those four who possessed experience in another logistics field had been assigned to more than one level in the chain of command in that field (X_3). Likewise, the mean number of months of actual job experience (X_2) of those 17 individuals was 20.58 months. Six of the 17, or 35.29 percent, had served less than one year in another logistics career area. These six add to the 41 DCMs who had no other logistics experience for a combined total of 48, or 81 percent of the sample population, with less than one year of experience in another logistics career area.

Finding One. Comparison of the results for this portion of the analysis to Air Force regulations supports

the theory that limited breadth of experience does exist. As stated earlier, AFR 36-1 suggests that the DCM obtain full qualification in another logistics career area. Since this qualification takes from 12 to 18 months to accomplish, 81 percent of the sample population did not comply. Furthermore, since 71 percent of the sample had never been assigned to another logistics (material) function, personal experience related knowledge of all material areas that affect aircraft maintenance seems unlikely. These results, coupled with the fact that none of the sample DCMs had completed another logistics technical school (See the X_7 results reported later in this chapter), support the opinion that limited breadth of experience (stovepiping) exists within the DCM career field.

Depth of Experience. Air Force Regulation 36-1 requires a DCM to have 12 months experience in aerospace maintenance director assignments and full qualification as a maintenance staff officer which requires another 12 months (7:A13-19). Further, the requirement for full qualification as maintenance staff officer suggests the need for full qualification as an entry level maintenance officer (7:A13-13). When the time necessary to fulfill all of these requirements is calculated, the DCM needs at least 48 months of prior maintenance experience before he/she can meet minimum depth of experience requirements (7:A13-13; A13-19). Although other avenues of entry into the DCM career field

allow many to legally circumvent the 48 month experience requirement, that criterion was used for this research.

Results of this portion of the analysis showed that 100 percent of the test sample had held previous jobs in aircraft maintenance (X_4) before being assigned as DCMs. The mean was four previous maintenance jobs with a maximum of 10. The number of months of previous maintenance experience (X_5) had a mean 56.47 months, with a maximum of 144 months and a minimum of 6 months. However, only 31 (53.45 percent) of the sample DCMs met the minimum requirement for 48 months of maintenance experience. Fifty-seven of the DCMs (98.28 percent) had served in more than one level in the chain of command (X_6). The mean number of levels was three.

<u>Finding Two</u>. Even though the DCMs studied in this research effort had a mean of 56.47 months of prior maintenance experience, the fact remains that 46.55 percent (27 DCMs) did not meet the 48 months criteria. Therefore, limited depth of experience does, to some extent, exist within the DCM career field.

<u>Other Independent Variables</u>. This section reports the results of the descriptive analysis of other variables that were thought to be related to the DCM's effectiveness. This analysis was conducted in conjunction with the pursuit of the first research objective.

X_7 - According to AFR 36-1, completion of an entry level maintenance officer technical school (course) is man-

datory, but only 40 (68.9 percent) of the DCMs in this study had completed this training. Furthermore, none had completed any other logistics technical school. Thus, approximately 31 percent of the sample population had no formal training in any logistics functional area.

X_8 - AFR 36-1 lists a master's degree as desirable, but not mandatory (7:A13-19). Analysis of the formal education level showed that 100 percent had a bachelor's degree while 31 or 53.45 percent had completed a master's degree. One DCM had completed a doctorate degree.

X_9 - According to AFR 36-23, the DCM should have professional military education (PME) through War College by the 23rd year of commissioned service (8:23-6). However, the PME histories of these individuals indicated that only 32 (55.17 percent) of the DCM's had completed the suggested three or more PME courses (8:23-6). Of the remaining twenty-six DCMs, four had completed only one PME course.

X_{10} - Although Air Force regulations do not quantify the professional continuing education (PCE) requirements for a DCM, AFR 36-23 does suggest the completion of some logistics-related PCE courses (8:23-7). This analysis showed that the number of logistics-related PCE courses completed by the sample DCMs had a mean of two. The maximum was seven and the minimum was zero. Fourteen (24.13%) of the DCMs had completed only one logistics related PCE courses. Nine (15.51%) had never completed a course related to logistics.

X_{11} - AFR 36-23 specifies a total commissioned service window from 22 to 30 years for assignment to the DCM position. (See Figure 1B.) Fifty-two DCMs (89.82 percent) met this requirement. The total years of commissioned service of the individuals in this study had a mean of 24.81 years. Thirty-eight (65.52 percent) of the DCMs had between 21 and 25 years of commissioned service, while 20 (34.48 percent) were spread over the 8 years from 26 to 33 years of experience. The modal value for the distribution was 24 years of commissioned service.

Finding Three. There is room for improvement on the variables X_7 through X_{10}. More specifically, 18 DCMs need to complete the maintenance officer technical school, 17 should complete a Master's Degree; 26 need more PME, and nine should complete some logistics related PCE. On the other hand, the values associated with total commissioned service variable, X_{11}, are well within the window specified by the regulation.

Research Objective Two: Hypothesis Testing

The results reported in this section pertain to the analysis of variance (ANOVA), data normalization, and the contingency analysis. The actual testing of hypotheses is addressed in the final portion of this section under contingency analysis.

ANOVA. The results of this procedure gave strong support to the assumption that the sample population was indeed divided into subgroups based on MAJCOM and aircraft type.

MAJCOM. The one way ANOVA of mission capable (MC) rate by MAJCOM defined two significant subpopulations with an F probability of zero. Subpopulation one was composed of a [illegible] DCMs and aircraft and subpopulation two consisted of [illegible] and SAC DCMs and aircraft. The Duncan's test and the [illegible] significant difference procedure also identified these same subpopulations.

Aircraft Type. The MC rate by aircraft type one way ANOVA identified three statistically significantly different subpopulations. Subpopulation one was composed of B52 and C5 DCMs. Subpopulation two consisted of C5 and C130 DCMs. Thus, C5s were not defined. However, for the purposes of this research, they were included in the B52 subpopulation based on the proximity of means. Finally, subpopulation three was composed of KC135, F4, and F16 DCMs. Once again, both the Duncan's test and the LSD procedure supported these findings.

Finding Four. As cited earlier in this research, the aircraft maintenance DCM population is divided into several subpopulations. These subpopulations are defined by MAJCOM and by aircraft type. Further, membership in either of these subpopulations has a direct effect on the MC rate which a DCM can achieve.

Normalization. The strategy for normalization centered around the subpopulations identified by the ANOVA procedures.

MAJCOM. The first attempt at normalizing the data involved using a zero-one binary code to represent effectiveness as measured by the MC rate in each of the MAJCOM defined subpopulations. This was done by obtaining the mean MC value for each subpopulation and assigning a one to represent the MC rate of all those DCMs whose MC rate was equal to or above the mean. All DCMs with MC rates below the mean were assigned a zero.

However, this method of normalization proved unsatisfactory because it led to a biased representation of the MC rate. For example, all B52 DCMs were assigned a zero (less effective) when the MAJCOM normalization was used.

Aircraft Type. This normalization procedure used the same binary code format that was used for the MAJCOM normalization. That is, the mean MC rate for each aircraft type subpopulation was the basis for assigning a one or a zero to the DCM in question. A one was considered more effective and a zero was considered less effective.

One problem that did arise with this method was that aircraft type three, C5s, were not significantly different from subpopulation one or subpopulation two. This difficulty was overcome by including C5s in subpopulation one based on the proximity of means and considering C130s to be an exclusive subpopulation.

Otherwise, no difficulty was encountered using this technique for normalization. In each case, DCMs from every type aircraft were divided fairly equally between those that were more effective and those that were less effective. Likewise, no MAJCOM bias was evident as each MAJCOM had an approximately equal number of more effective and less effective DCMs. Thus, the aircraft type technique was used to normalize the MC rate data. See Appendix B.

Finding Five. The difficulty encountered in the MAJCOM normalization attempt supports the opinion that the MC rate is affected more by aircraft type than by MAJCOM.

Contingency Table Analysis. This portion of the research tested the following research hypotheses using the indicated variables:

Hypothesis 1: There is no relationship between the breadth of experience exhibited in an individual DCM's career pattern and his/her demonstrated performance when compared to a standard measure of DCM effectiveness. (X_1, X_2, X_3)

The null case could not be rejected for the first research hypothesis. However, the manner in which this came about was less than satisfactory. Although, the Chi-square statistic was small for every variable, X_1, X_2, and X_3, the F-test probability was too large to allow statistically meaningful conclusions. (See Appendix D.)

Hypothesis 2: There is no relationship between a DCM's depth of experience in aircraft maintenance and the degree of effectiveness he/she achieves. (X_4, X_5, X_6)

Results of the testing of the second research duplicated the results obtained for the first research hypothesis. That is, the null case could not be rejected, but for less than satisfactory reasons. (See Appendix D.)

Hypothesis 3: There is no interrelationship between breadth and depth of experience which affects the degree of effectiveness achieved by a DCM. (X_1, X_2, X_3, X_4, X_5, X_6)

The third research hypothesis could not be addressed because of the limitations on the minimum expected cell frequency imposed by Seigal (28:201). Every attempt at testing for an interrelationship between breadth and depth of experience which affects the MC rate led to expected cell frequencies of less than five and sometimes one or less.

In addition, the contingency table analysis was used to look for a relationship between the additional independent variables (X_7, X_8, X_9, X_{10}, and X_{11}) and effectiveness. Results from this portion of the research duplicated those obtained for the first and second research hypotheses. Appendix D details all of the contingency tables and presents the statistical test results.

A final attempt at developing statistically valid evidence for the existence or nonexistence of a relationship

between experience and effectiveness was made by the addition of a contingency table which tested aeronautical rating against effectiveness. This was done by coding pilots as one, navigators as two, and non-rated DCMs as three. However, this table, like the others, failed to show any conclusive results.

V. Conclusions, Impact, & Recommendations

Conclusions

The conclusions that can be drawn from this research effort are necessarily limited by the ambiguous nature of the contingency analysis. However, some valid conclusions are possible.

Research Objective One. This objective was concerned with determining whether evidence of limited breadth (stovepiping) and depth of experience could be determined.

Existence of Stovepiping. Although no conclusive definition of what exactly constitutes stovepiping has yet been developed, the limited logistics experience base exhibited by the individuals in this sample seems to support the fact that stovepiping in the maintenance function does exist. Furthermore, it also seems valid to conclude that stovepiping exists in the DCM career field. However, because of problems with the sample size and, possibly, the measure of effectiveness, no evidence was developed to either support or deny the contention that stovepiping is detrimental to the effectiveness of the individual DCM.

Limited Depth of Experience. The fact that 46.55 percent of the sample did not meet regulation-implied time requirements for qualification as a DCM is strong evidence that this condition exists. However, as with stovepiping,

there was no evidence either for or against any supposed harmful effects.

Research Objective Two. The purpose of this second, but primary, objective was to determine what, if any, relationships exist between a DCM's experience base and his/her demonstrated effectiveness. This was approached by testing the following three research hypotheses:

1. There is no relationship between the breadth of experience exhibited in an individual DCM's career pattern and his/her demonstrated performance when compared to a standard measure of DCM effectiveness.

2. There is no relationship between a DCM's depth of experience in aircraft maintenance and the degree of effectiveness he/she achieves.

3. There is no interrelationship between breadth of experience and depth of experience which affects the degree of effectiveness achieved by a DCM.

However, because of problems which were detailed in the last chapter, no statistically reliable results or conclusions which related directly to the research objective were obtained from this phase of the research. On the other hand, one incidental, but interesting, conclusion did surface. The following section details this conclusion.

Multiple Populations. The results of this research lend considerable support to the assumption that the DCM population exists in subgroups. The results indicate that these subpopulations are based on MAJCOM and aircraft type. Further, the results also suggest that the

mission capable rate is more aircraft type dependent than MAJCOM dependent.

Impact

The fact that limited depth and breadth of experience do exist leads to many questions concerning the impact of these conditions. However, since this research was unable to adequately address these questions, further research is needed. Recommendations concerning follow-on research are contained in the next section.

Recommendations

Analysis of the problems encountered in this research indicates that they flow from two sources. These are the measure of effectiveness and the sample size.

The DCM's job has many facets and the MC rate may not be an adequate measure of all of these. Thus, the failure to demonstrate conclusive results in the contingency analysis may have been the result of an inadequate measure of effectiveness.

Furthermore, the inability to test the third research hypothesis was definitely related to the sample size. In other words, the small number of individuals in the test sample precluded statistically reliable expected cell frequencies in large contingency tables. Therefore, there are two recommendations which pertain to any future research in this area.

1. Future researchers should make a concerted effort to find a better measure of effectiveness for the DCM population. One possible way of achieving this may be to use factor analysis to construct a composite measure. This composite measure might be drawn from statistics such as the MC rate, due-in-from-maintenance rates, on-time take-offs, abort rates, sortie cancellation rates, inspection results, "hangar queen" rates, and others.

2. In future research, every attempt should be made to obtain a larger test sample. It is possible that this might be achieved by relaxing some of the inclusion rules that were used in this effort.

If these recommendations reduce or eliminate the problems encountered in this research effort, future researchers may be able to measure the impacts of limited breadth and depth of experience upon a DCM's effectiveness.

Appendix A: Raw Data

The order of data arrangement, from left to right, is: ID, CMD, RATING, AC, MSN, ASLOG, MOLOG, LELOG, MXJOB, MXMO, LEMX, LOGTE, FORMED, PME, PCE, YRS, FMC, and MC. A key to variable names is contained in the variable labels statement of the computer program. See Appendix C.

01	T	NA	01	OP	0	00	0	02	023	2	1	16	2	1	26	61.26	71.17
02	T	PI	01	MI	0	00	0	03	035	2	0	16	2	2	24	77.51	81.02
03	T	PI	01	PT	0	00	0	02	024	2	0	16	2	1	24	71.93	80.73
04	T	NR	01	MI	2	36	2	04	086	6	1	18	3	2	24	54.46	76.96
05	T	NA	01	MI	1	08	1	06	060	5	1	16	1	4	28	36.73	66.65
06	T	NA	01	OP	0	00	0	04	053	1	1	18	3	1	22	75.02	82.23
07	T	NR	01	MI	0	00	0	06	063	6	1	16	3	3	23	56.16	69.31
08	T	PI	01	OP	0	00	0	01	012	2	0	16	2	4	30	75.05	81.72
09	T	NR	02	OP	0	00	0	10	097	4	1	18	4	1	21	61.92	67.26
10	T	NR	02	OP	1	13	1	03	084	4	1	18	4	4	22	89.36	89.66
11	T	NR	02	MI	0	00	0	08	080	4	1	18	4	4	22	58.76	65.90
12	T	NR	02	OP	1	22	1	06	075	4	1	18	3	0	21	82.05	82.28
13	T	NR	02	OP	1	05	1	09	065	4	1	18	4	7	21	72.40	74.38
14	T	NR	02	PT	0	00	0	04	096	4	1	18	2	4	23	77.04	79.98
15	M	PI	03	OP	0	00	0	05	043	2	1	16	3	3	24	51.14	54.70
16	M	NR	03	OP	1	11	1	07	102	4	1	18	4	3	22	51.79	53.21
17	M	NR	03	OP	0	00	0	06	110	4	1	18	2	5	23	53.28	56.19
18	M	PI	03	OP	0	00	0	02	060	2	0	16	2	2	30	46.86	48.65

19	M	NR	03	OP	1	39	1	05	089	3	1	18	3	2	22	38.35	48.44
20	M	PI	03	OP	0	00	0	02	039	2	1	16	3	0	28	52.33	55.99
21	M	NA	03	PT	1	18	1	07	082	4	0	18	3	5	24	07.08	33.74
22	M	PI	04	OP	0	00	0	01	021	2	0	16	2	1	23	23.09	49.33
23	M	PI	04	OP	0	00	0	02	043	2	1	18	2	2	23	21.09	66.61
24	M	PI	04	OP	1	34	1	03	025	2	0	16	1	1	27	21.97	49.90
25	M	NA	04	OP	0	00	0	03	057	2	0	18	2	1	28	31.88	57.68
26	M	NA	04	PT	0	00	0	02	029	2	1	18	3	2	24	08.28	56.71
27	M	PI	04	OP	2	11	2	01	018	1	0	16	2	1	24	22.62	54.83
28	M	NA	04	OP	0	00	0	02	023	2	1	16	3	0	27	20.40	58.00
29	M	PI	04	PT	0	00	0	03	069	2	0	18	4	3	23	06.93	60.63
30	M	NA	04	OP	0	00	0	03	035	2	1	18	2	1	29	40.48	57.71
31	S	NR	05	OP	1	04	1	06	109	4	0	18	3	5	21	49.81	51.24
32	S	NA	05	OP	0	00	0	04	030	2	1	16	2	0	28	40.39	74.41
33	S	PI	05	OP	0	00	0	01	006	1	1	16	3	2	29	56.12	58.40
34	S	NR	05	OP	1	18	1	06	141	4	1	18	2	3	21	47.43	47.48
35	S	PI	05	OP	0	00	0	06	062	3	0	16	2	0	28	47.13	51.53
36	S	NA	05	OP	0	00	0	01	009	1	0	18	4	2	25	38.25	38.64
37	S	PI	05	OP	0	00	0	01	012	1	0	16	3	1	26	49.01	49.69
38	S	NA	05	OP	0	00	0	02	024	2	1	18	3	2	26	41.66	41.81
39	S	PI	05	OP	0	00	0	01	016	1	0	18	3	1	25	39.83	40.88
40	S	PI	05	OP	1	36	1	03	053	2	1	20	2	6	33	49.62	50.44
41	S	PI	05	OP	0	00	0	01	020	1	1	16	1	0	29	44.23	45.57
42	S	PI	05	OP	0	00	0	02	019	1	1	16	1	0	27	43.83	44.78
43	S	NA	05	UP	0	00	0	02	047	2	1	18	3	2	24	49.08	50.21

44	S	NA	05	OP	0	00	0	05	088	3	1	16	3	2	25	42.95	43.68
45	S	PI	06	OP	1	06	1	03	099	2	0	18	2	2	30	63.18	66.00
46	S	NA	06	OP	0	00	0	02	039	2	1	16	3	1	25	63.43	67.03
47	S	PI	06	OP	0	00	0	04	064	2	1	18	3	2	25	68.49	71.83
48	S	NR	06	OP	0	00	0	09	144	5	1	18	3	4	21	73.29	74.46
49	S	NA	06	OP	0	00	0	07	107	4	1	16	3	3	25	62.85	67.34
50	S	NA	06	OP	0	00	0	04	077	2	1	18	3	1	22	64.21	66.35
51	S	NR	06	OP	2	26	2	05	098	3	1	18	2	5	22	66.19	68.28
52	S	PI	06	OP	0	00	0	01	008	1	1	18	3	0	26	71.37	74.54
53	S	PI	06	OP	0	00	0	01	008	1	1	16	3	1	27	67.33	76.39
54	S	NR	06	OP	0	00	0	07	095	3	1	18	4	2	24	68.21	70.70
55	S	PI	06	OP	0	00	0	01	017	1	0	18	2	2	25	64.67	66.83
56	S	PI	06	OP	0	00	0	04	042	2	0	16	2	4	23	80.29	82.23
57	S	NA	06	OP	1	26	1	03	060	3	1	16	2	0	23	77.43	79.01
58	S	NR	06	OP	3	39	3	08	083	3	1	16	3	3	22	75.66	77.45

Appendix B: Coded Data

The order of data arrangement, from left to right, is: ID, CMD, RATING, AC, MSN, ASLOG, MOLOG, LELOG, MXJOB, MXMO, LEMX, LOGTE, FORMED, PME, PCE, YRS, MC, and EFF. A key to the variable names is contained in the variable labels statement of the computer program. See Appendix C.

01	T	NA	01	OP	00	00	00	00	001	00	01	01	00	00	01	71.17	0
02	T	PI	01	MI	00	00	00	00	002	00	00	01	00	00	00	81.02	1
03	T	PI	01	PT	00	00	00	00	001	00	00	01	00	00	00	80.73	1
04	T	NR	01	MI	01	01	01	01	004	01	01	00	01	00	00	76.96	1
05	T	NA	01	MI	01	00	01	01	003	01	01	01	00	01	01	66.65	0
06	T	NA	01	OP	00	00	00	01	003	00	01	00	01	00	00	82.23	1
07	T	NR	01	MI	00	00	00	01	003	01	01	01	01	01	00	69.31	0
08	T	PI	01	OP	00	00	00	00	001	00	00	01	00	01	01	81.72	1
09	T	NR	02	OP	00	00	00	01	005	01	01	00	01	00	00	67.26	0
10	T	NR	02	OP	01	01	01	00	004	01	01	00	01	01	00	89.66	1
11	T	NR	02	MI	00	00	00	01	004	01	01	00	01	01	00	65.90	0
12	T	NR	02	OP	01	01	01	01	004	01	01	00	01	00	00	82.28	1
13	T	NR	02	OP	01	00	01	01	003	01	01	00	01	01	00	71.38	0
14	T	NR	02	PT	00	00	00	01	004	01	01	00	00	01	00	79.98	1
15	M	PI	03	OP	00	00	00	01	002	00	01	01	01	01	00	54.70	1
16	M	NR	03	OP	01	00	01	01	005	01	01	00	01	01	00	53.21	1
17	M	NR	03	OP	00	00	00	01	005	01	01	00	00	01	00	56.19	1
18	M	PI	03	OP	00	00	00	00	003	00	00	01	00	00	01	48.65	0

19	M	NR	03	OP	01	01	01	01	004	01	01	00	01	00	00	48.44	0
20	M	PI	03	OP	00	00	00	00	002	00	01	01	01	00	01	55.99	1
21	M	NA	03	PT	01	01	01	01	004	01	00	00	01	01	00	33.74	0
22	M	PI	04	OP	00	00	00	00	001	00	00	01	00	00	00	49.33	0
23	M	PI	04	OP	00	00	00	00	002	00	01	00	00	00	00	66.61	1
24	M	PI	04	OP	01	01	01	00	002	00	00	01	00	00	01	49.90	0
25	M	NA	04	OP	00	00	00	00	003	00	00	00	00	00	01	57.68	1
26	M	NA	04	PT	00	00	00	00	002	00	01	00	01	00	00	56.71	0
27	M	PI	04	OP	01	00	01	00	001	00	00	01	00	00	00	54.83	0
28	M	NA	04	OP	00	00	00	00	001	00	01	01	01	00	01	58.00	1
29	M	PI	04	PT	00	00	00	00	003	00	00	00	01	01	00	60.63	1
30	M	NA	04	OP	00	00	00	00	002	00	01	00	00	00	01	57.71	1
31	S	NR	05	OP	01	00	01	01	005	01	00	00	01	01	00	51.24	1
32	S	NA	05	OP	00	00	00	01	002	00	01	01	00	00	01	74.41	1
33	S	PI	05	OP	00	00	00	01	001	00	01	01	01	00	01	58.40	1
34	S	NR	05	OP	01	01	01	01	005	01	01	00	00	01	00	47.48	0
35	S	PI	05	OP	00	00	00	01	003	01	00	01	00	00	01	51.53	1
36	S	NA	05	OP	00	00	00	00	001	00	00	00	01	00	01	38.64	0
37	S	PI	05	OP	00	00	00	00	001	00	00	01	00	00	01	49.69	1
38	S	NA	05	OP	00	00	00	00	001	00	01	00	01	00	01	41.81	0
39	S	PI	05	OP	00	00	00	00	001	00	00	00	01	00	01	40.88	0
40	S	PI	05	OP	01	01	01	00	002	00	01	00	00	01	01	50.44	1
41	S	PI	05	OP	00	00	00	00	001	00	01	01	00	00	01	45.57	0
42	S	PI	05	OP	00	00	00	00	001	00	01	01	00	00	01	44.78	0
43	S	NA	05	OP	00	00	00	00	002	00	01	00	01	00	00	50.21	1

44	S	NA	05	OP	00	00	00	01	004	01	01	01	01	00	01	43.68	0
45	S	PI	06	OP	01	00	01	00	005	00	00	00	00	00	01	66.00	0
46	S	PI	06	OP	00	00	00	00	002	00	01	01	01	00	01	67.03	0
47	S	PI	06	OP	00	00	00	01	003	00	01	00	01	00	01	71.83	0
48	S	NR	06	OP	00	00	00	01	004	01	01	00	01	01	00	74.46	1
49	S	NA	06	OP	00	00	00	01	005	01	01	01	01	01	01	67.34	0
50	S	NA	06	OP	00	00	00	01	004	00	01	00	01	00	00	66.35	0
51	S	NR	06	OP	01	01	01	01	005	01	01	00	00	01	00	68.28	0
52	S	PI	06	OP	00	00	00	00	001	00	01	00	01	00	01	74.57	1
53	S	PI	06	OP	00	00	00	00	001	00	01	01	01	00	01	76.39	1
54	S	NR	06	OP	00	00	00	01	004	01	01	00	01	00	00	70.70	0
55	S	PI	06	OP	00	00	00	00	001	00	00	00	00	00	01	66.83	0
56	S	PI	06	OP	00	00	00	01	002	00	00	01	00	01	00	82.23	1
57	S	NA	06	OP	01	01	01	00	003	01	01	01	00	00	00	79.01	1
58	S	NR	06	OP	01	01	01	01	004	01	01	01	01	01	00	77.45	1

Appendix C: Computer Program

```
$JOB,THESIS,2052LSMS,COL430,TIME=1000,OUT=OUT8,PI=15

SPSS*SPSS9

RUN NAME      THESIS

VARIABLE      ID,CMD,RATING,AC,
  LIST
              MSN,ASLOG,MOLOG,LELOG,

              MXJOB,MXMD,LEMX,LOGTE,

              FORMED,PME,PCE,YRS,MC,EFF

N OF CASES    58

INPUT         2052LSMS*DATA2
MEDIUM

INPUT
FORMAT

              FIXED(F2.0,1X,A1,1X,A2,1X,F2.0,1X,A2,1X,F2.0,1X,

              F2.0,1X,F2.0,1X,F2.0,1X,F3.0,1X,F2.0,1X,F2.0,1X,

              F2.0,1X,F2.0,1X,F2.0,1X,F2.0,1X,F5.2,1X,F1.0)

RECODE        CMD('T'=1)('M'=2)('S'=3)

RECODE        RATING('PI'=1)('NA'=2)('NR'=3)

VAR LABELS    ID,POSITION IN FILE/

              CMD,MAJCOM/

              RATING,AERONAUTICAL RATING/

              AC,AIRCRAFT TYPE/

              MSN,UNIT MISSION TYPE/

              ASLOG,ASSIGNMENTS IN OTHER LOG FIELDS/

              MOLOG,MONTHS SPENT IN OTHER LOG FIELDS/
```

```
               LELOG,COMMAND LEVELS SERVED IN/
               MXJOB,OTHER MX JOBS HELD/
               MXMO,MONTHS SPENT IN OTHER MX JOBS/
               LOGTE,LOG TECH SCHOOLS COMPLETED/
               LEMX,LEVELS OF COMMAND SERVED IN/
               PME,COURSES COMPLETED/
               PCE,LOG OR MX PCE COMPLETED/
               YRS,YEARS OF ACTIVE COMM SERVICE/
               EFF,EFFECTIVENESS BASED ON MC RATE
VALUE          AC (1)F4 (2)F16 (3)C5 (4)C13Ø (5)B52 (6)KC135
LABELS
               /ASLOG (1)WITH (Ø)NONE
               /MOLOG (1)>12 MO (Ø)12 MO OR LESS
               /MXJOB (1)MEAN OR ABOVE (Ø)BELOW MEAN
               /MXMO (1)<24MO (2)25-48MO (3)49-72MO (4)73-96MO
                 (5)>97MO
               /LEMX (1)MEAN OR ABOVE (Ø)BELOW MEAN
               /LOGTE (1)WITH (Ø)NONE
               /FORMED (1)MASTERS DEGREE (Ø)BACHELORS DEGREE
               /PME (1) 3 OR MORE (Ø) LESS THAN 3
               /PCE (1)MEAN OR ABOVE (Ø)BELOW MEAN
               /YRS (1)MEAN OR ABOVE (Ø)BELOW MEAN
ONEWAY         MC BY CMD (1,3)
               RANGES = DUNCAN/
               RANGES = LSD/
STATISTICS     ALL
```

```
SCATTERGRAM      CMD (1,3) WITH MC
OPTIONS          7
STATISTICS       ALL
*SELECT IF       (CMD EQ 2 OR CMD EQ 3)
CONDESCRIPTIVE   MC
STATISTICS       ALL
*SELECT IF       (CMD EQ 1)
CONDESCRIPTIVE   MC
ONEWAY           MC BY AC (1,6)
                 RANGES = DUNCAN/
                 RANGES = LSD/
STATISTICS       ALL
SCATTERGRAM      AC (1,6) WITH MC
*SELECT IF       (AC EQ 5 OR AC EQ 3)
CONDESCRIPTIVE   MC
STATISTICS       1
*SELECT IF       ((AC EQ 6 OR AC EQ 2) OR AC EQ 1)
CONDESCRIPTIVE   MC
STATISTICS       1
*SELECT IF       (AC EQ 4)
CONDESCRIPTIVE   MC
STATISTICS       1
CROSSTABS        TABLES=EFF BY RATING,ASLOG,MOLOG,MXJOB,
                 MXMO,LEMX,LOGTE,FORMED,PME,PCE,YRS
STATISTICS       1,2,3,4,5
FINISH
```

Appendix D: Crosstabulations and Statistics

CROSSTABULATION OF
EFFECTIVENESS BY ASSIGNMENTS IN OTHER LOG FIELDS (X_1)

ASLOG

EFFECTIVNESS	COUNT / ROW % / COL % / TOT %	NONE 0.	WITH 1.	ROW TOTAL
MORE EFF	1.	22	8	30
		73.3	26.7	51.7
		52.4	50.0	
		37.9	13.8	
LESS EFF	0.	19	9	28
		67.9	32.1	48.3
		46.3	52.9	
		32.8	15.5	
	COLUMN	41	17	58
	TOTAL	70.7	29.3	100.0

CORRECTED CHI SQUARE = 0.02863 WITH 1 DEGREE OF FREEDOM.
SIGNIFICANCE = 0.8656

RAW CHI SQUARE = 0.20962 WITH 1 DEGREE OF FREEDOM.
SIGNIFICANCE = 0.6471

CROSSTABULATION OF
EFFECTIVENESS BY TOTAL MONTHS SPENT IN OTHER LOG FIELDS (X_2)

MOLOG

EFFECTIVENESS	COUNT / ROW % / COL % / TOT %	12 MO OR LESS 0.	>12 MO 1.	ROW TOTAL
MORE EFF	1.	24	6	30
		80.0	20.0	51.7
		51.1	54.5	
		41.4	10.3	
LESS EFF	0.	23	5	28
		82.1	17.9	48.3
		48.9	45.5	
		39.7	8.6	
	COLUMN	47	11	58
	TOTAL	81.0	19.0	100.0

CORRECTED CHI SQUARE = 0.00000 WITH 1 DEGREE OF FREEDOM.
SIGNIFICANCE = 1.0000

RAW CHI SQUARE = 0.04327 WITH 1 DEGREE OF FREEDOM.
SIGNIFICANCE = 0.8352

CROSSTABULATION OF
EFFECTIVENESS BY OTHER MX JOBS HELD (X_4)

MXJOB

EFFECTIVENESS	COUNT / ROW % / COL % / TOT %	BELOW MEAN Ø.	MEAN OR ABOVE 1.	ROW TOTAL
MORE EFF	1.	16	14	30
		53.3	46.7	51.7
		53.3	50.Ø	
		27.6	24.1	
LESS EFF	Ø.	14	14	28
		50.Ø	50.Ø	48.3
		46.7	50.Ø	
		24.1	24.1	
	COLUMN	30	28	58
	TOTAL	51.7	48.3	100.Ø

CORRECTED CHI SQUARE = Ø.ØØØØØ WITH 1 DEGREE OF FREEDOM.
SIGNIFICANCE = 1.ØØØØ

RAW CHI SQUARE = Ø.Ø6444 WITH 1 DEGREE OF FREEDOM.
SIGNIFICANCE = Ø.7996

CROSSTABULATION OF
EFFECTIVENESS BY MONTHS SPENT IN OTHER MX JOBS (X_5)

MXMO

EFF	COUNT / ROW % / COL % / TOT %	<24MO 1.	25-48MO 2.	49-72MO 3.	73-96MO 4.	>97MO 5.	ROW TOTAL
MORE EFF	1.	7	9	5	5	4	30
		23.3	30.0	16.7	16.7	13.3	51.7
		43.8	75.0	50.0	45.5	44.4	
		12.1	15.5	8.6	8.6	6.9	
LESS EFF	0.	9	3	5	6	5	28
		32.1	10.7	17.9	21.4	17.9	48.3
		56.3	25.0	50.0	54.5	55.6	
		15.5	5.2	8.6	10.3	8.6	
	COLUMN	16	12	10	11	9	58
	TOTAL	27.6	20.7	17.2	19.0	15.5	100.0

CHI SQUARE = 3.38708 WITH 4 DEGREES OF FREEDOM
SIGNIFICANCE = 0.4953

CROSSTABULATION OF
EFFECTIVENESS BY MAINTENANCE COMMAND LEVELS SERVED IN (X_6)

LEMX

EFFECTIVENESS	COUNT / ROW % / COL % / TOT %	BELOW MEAN Ø.	MEAN OR ABOVE 1.	ROW TOTAL
MORE EFF	1.	19	11	3Ø
		63.3	36.7	51.7
		55.9	45.8	
		32.8	19.Ø	
LESS EFF	Ø.	16	12	28
		57.1	42.9	48.3
		45.7	52.2	
		27.6	2Ø.7	
	COLUMN	35	23	58
	TOTAL	6Ø.3	39.7	1ØØ.Ø

CORRECTED CHI SQUARE = Ø.Ø4537 WITH 1 DEGREE OF FREEDOM.
SIGNIFICANCE = Ø.8313

RAW CHI SQUARE = Ø.23193 WITH 1 DEGREE OF FREEDOM.
SIGNIFICANCE = Ø.63Ø1

CROSSTABULATION OF
EFFECTIVENESS BY LOGISTICS TECHNICAL SCHOOLS COMPLETED (X_7)

LOGTE

EFFECTIVENESS	COUNT / ROW % / COL % / TOT %	NONE 0.	WITH 1.	ROW TOTAL
MORE EFF	1.	9	21	30
		30.0	70.0	51.7
		50.0	52.5	
		15.5	36.2	
LESS EFF	0.	9	19	28
		32.1	67.9	48.3
		50.0	47.5	
		15.5	32.8	
	COLUMN	18	40	58
	TOTAL	31.0	69.0	100.0

CORRECTED CHI SQUARE = 0.00000 WITH 1 DEGREE OF FREEDOM.
SIGNIFICANCE = 1.0000

RAW CHI SQUARE = 0.03107 WITH 1 DEGREE OF FREEDOM.
SIGNIFICANCE = 0.8601

CROSSTABULATION OF
EFFECTIVENESS BY FORMAL EDUCATION (X_8)

FORMED

EFFECTIVENESS	COUNT ROW % COL % TOT %	BACHELOR'S DEGREE Ø.	MASTER'S DEGREE 1.	ROW TOTAL
MORE EFF	1.	14 46.7 53.8 24.1	16 53.3 50.Ø 27.6	3Ø 51.7
LESS EFF	Ø.	12 42.9 46.2 20.7	16 57.1 50.Ø 27.6	28 48.3
	COLUMN TOTAL	26 44.8	32 55.2	58 1ØØ.Ø

CORRECTED CHI SQUARE = Ø.ØØØ75 WITH 1 DEGREE OF FREEDOM.
SIGNIFICANCE = Ø.9782

RAW CHI SQUARE = Ø.Ø8498 WITH 1 DEGREE OF FREEDOM.
SIGNIFICANCE = Ø.77Ø7

CROSSTABULATION OF
EFFECTIVENESS BY PROFESSIONAL MILITARY
EDUCATION COURSES COMPLETED (X_9)

PME

EFFECTIVENESS	COUNT ROW % COL % TOT %	LESS THAN THREE Ø.	THREE OR MORE 1.	ROW TOTAL
	1.	14	16	3Ø
MORE EFF		46.7	53.3	51.7
		53.8	5Ø.Ø	
		24.1	27.6	
	Ø.	12	16	28
LESS EFF		42.9	57.1	48.3
		46.2	5Ø.Ø	
		2Ø.7	27.6	
	COLUMN	26	32	58
	TOTAL	44.8	55.2	1ØØ.Ø

CORRECTED CHI SQUARE = Ø.ØØØ75 WITH 1 DEGREE OF FREEDOM.
SIGNIFICANCE = Ø.9782

RAW CHI SQUARE = Ø.Ø8498 WITH 1 DEGREE OF FREEDOM.
SIGNIFICANCE = Ø.77Ø7

CROSSTABULATION OF EFFECTIVENESS BY LOGISTICS AND MAINTENANCE PROFESSIONAL CONTINUING EDUCATION COMPLETED (X_{10})

PCE

EFFECTIVENESS	COUNT / ROW % / COL % / TOT %	BELOW MEAN 0.	MEAN OR ABOVE 1.	ROW TOTAL
	1.	18	12	30
MORE EFF		60.0	40.0	51.7
		47.4	60.0	
		31.0	20.7	
	0.	20	8	28
LESS EFF		71.4	28.6	48.3
		52.6	40.0	
		34.5	13.8	
	COLUMN	38	20	58
	TOTAL	65.5	34.5	100.0

CORRECTED CHI SQUARE = 0.40784 WITH 1 DEGREE OF FREEDOM.
SIGNIFICANCE = 0.5231

RAW CHI SQUARE = 0.83729 WITH 1 DEGREE OF FREEDOM.
SIGNIFICANCE = 0.3602

CROSSTABULATION OF
EFFECTIVENESS BY YEARS OF ACTIVE COMMISSIONED SERVICE (X_{11})

EFFECTIVENESS	COUNT / ROW % / COL % / TOT %	YRS: BELOW MEAN 0.	MEAN OR ABOVE 1.	ROW TOTAL
MORE EFF	1.	18	12	30
		60.0	40.0	51.7
		58.1	44.4	
		31.0	20.7	
LESS EFF	0.	13	15	28
		46.4	53.6	48.3
		41.9	55.6	
		22.4	25.9	
	COLUMN	31	27	58
	TOTAL	53.4	46.6	100.0

CORRECTED CHI SQUARE = 0.59602 WITH 1 DEGREE OF FREEDOM.
SIGNIFICANCE = 0.4401

RAW CHI SQUARE = 1.07209 WITH 1 DEGREE OF FREEDOM.
SIGNIFICANCE = 0.3005

CROSSTABULATION OF
EFFECTIVENESS BY AERONAUTICAL RATING

EFFECTIVENESS	COUNT / ROW % / COL % / TOT %	RATING: PILOT	NAV	NON RATED	ROW TOTAL
MORE EFF	1.	14	7	9	30
		46.7	23.3	30.0	51.7
		58.3	41.2	52.9	
		24.1	12.1	15.5	
LESS EFF	0.	10	10	8	28
		35.7	35.7	28.6	48.3
		41.7	58.8	47.1	
		17.2	17.2	13.8	
	COLUMN	24	17	17	58
	TOTAL	41.4	29.3	29.3	100.0

CHI SQUARE = 1.18735 WITH 2 DEGREES OF FREEDOM.
SIGNIFICANCE = 0.5523

Appendix E. Descriptive Histograms for All Variables

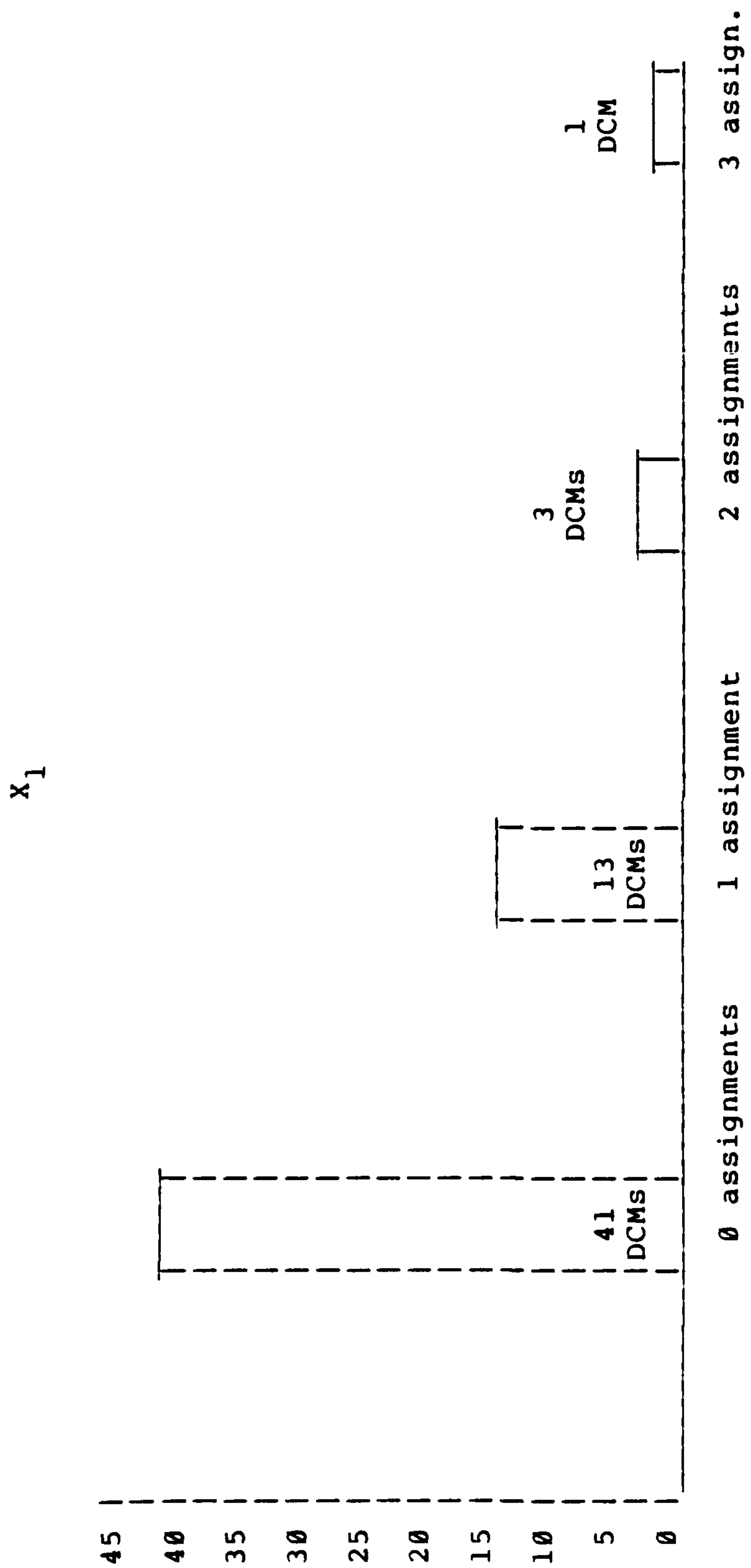


Figure 8. Number of DCMs by Number of Assignments in Other Logistics Fields

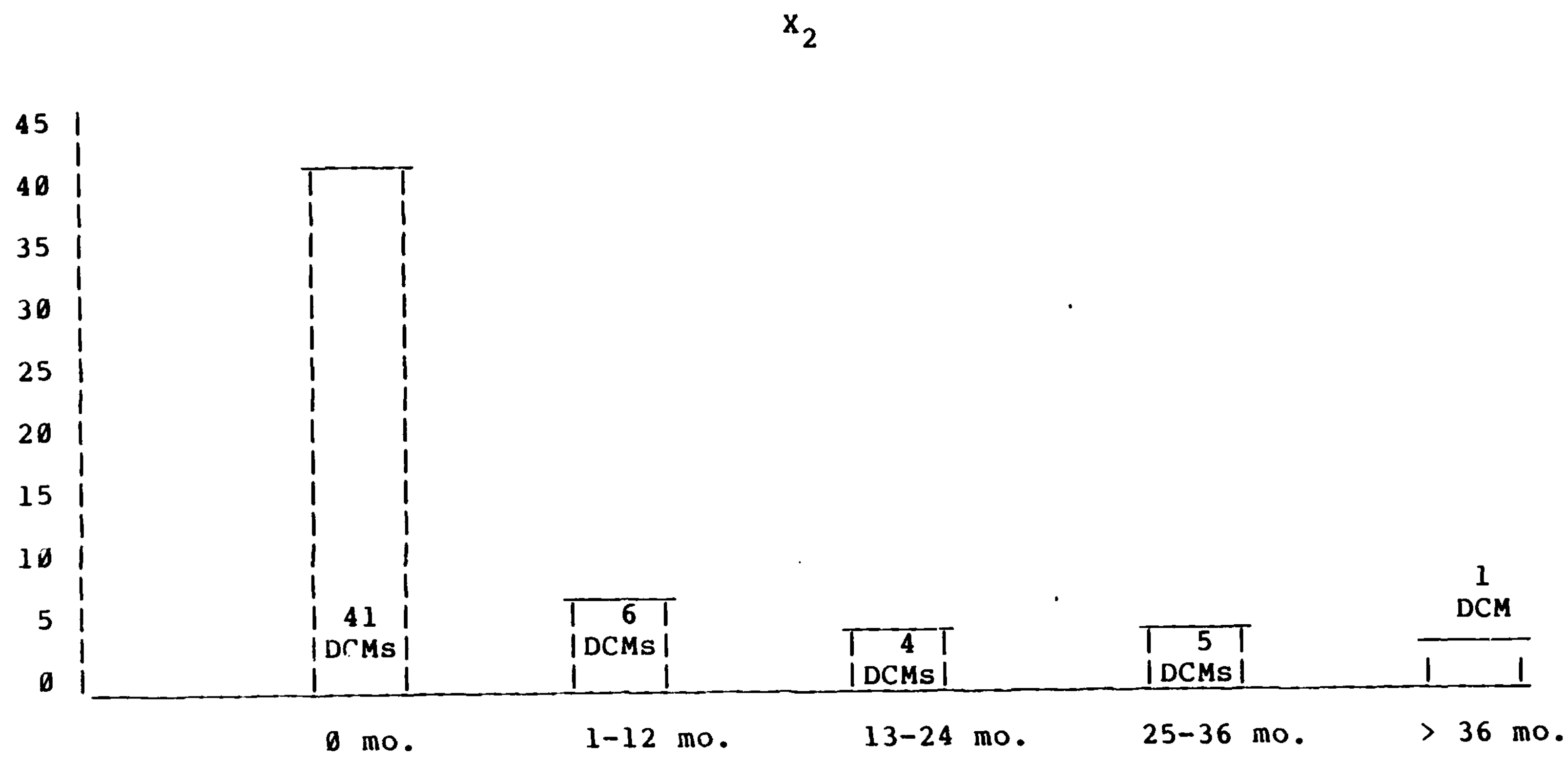


Figure 9. Number of DCMs by Number of Months Spent in Other Logistics Fields

AD-A160 840 DEPUTY COMMANDER FOR MAINTENANCE EXPERIENCE AND EFFECTIVENESS: IS THERE A RELATIONSHIP?(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF SYST

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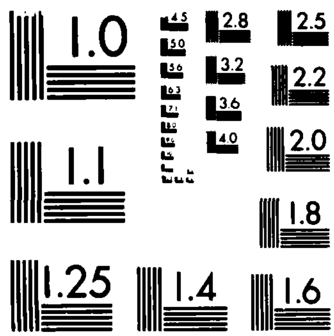

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

X_3

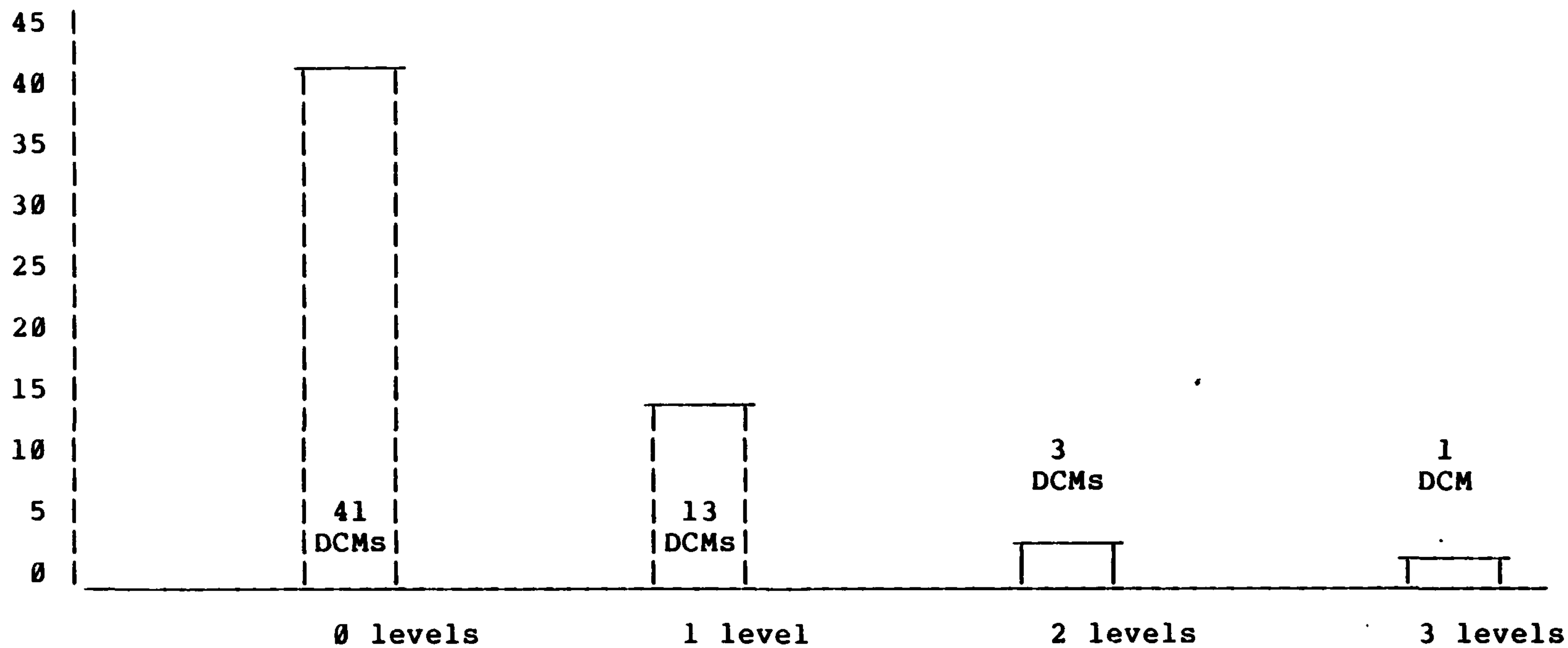

Figure 10. Number of DCMs by Number of Levels of Assignment in Other Logistics Fields

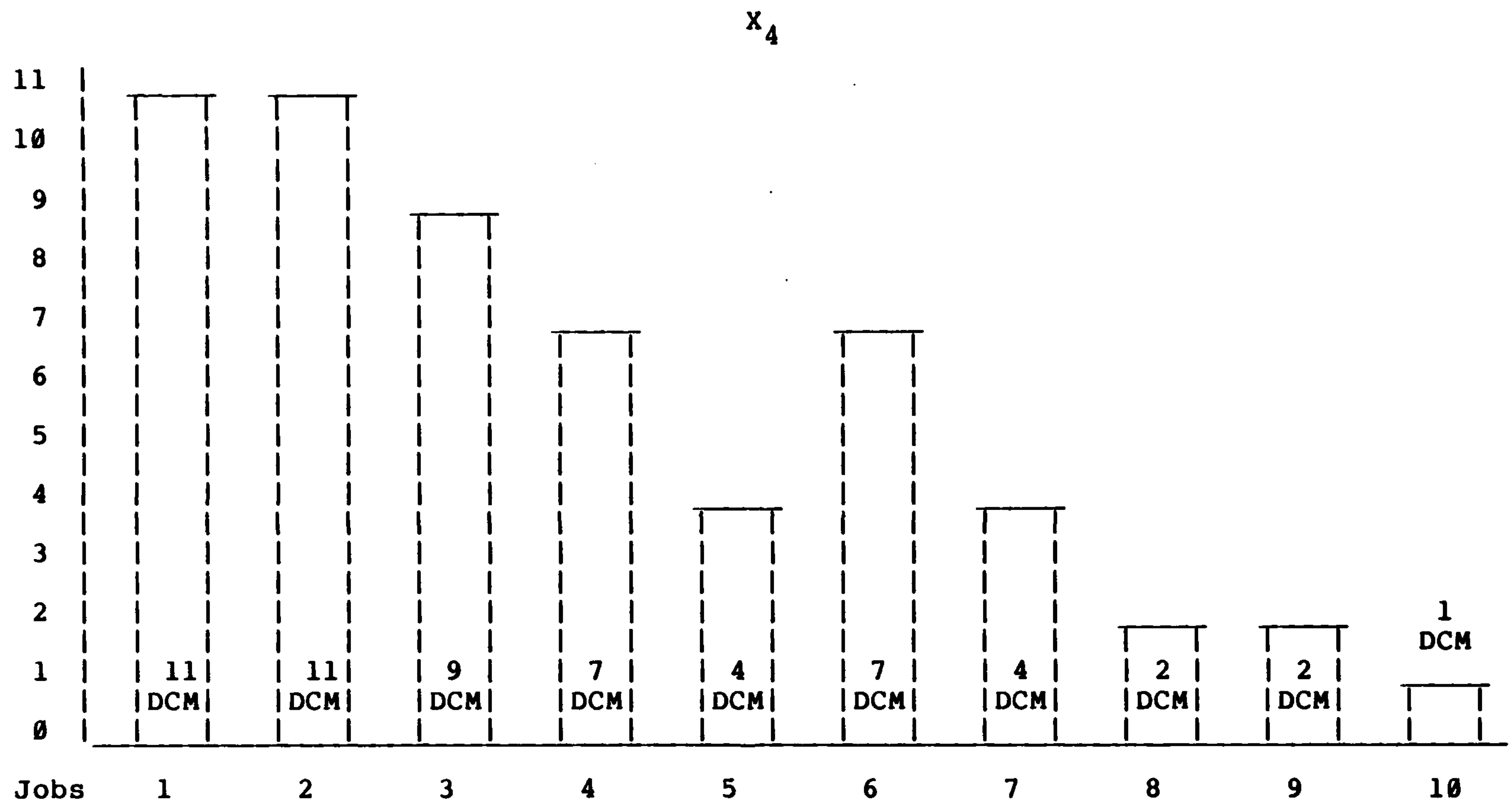

Figure 11. Number of DCMs by Number Different Maintenance Jobs

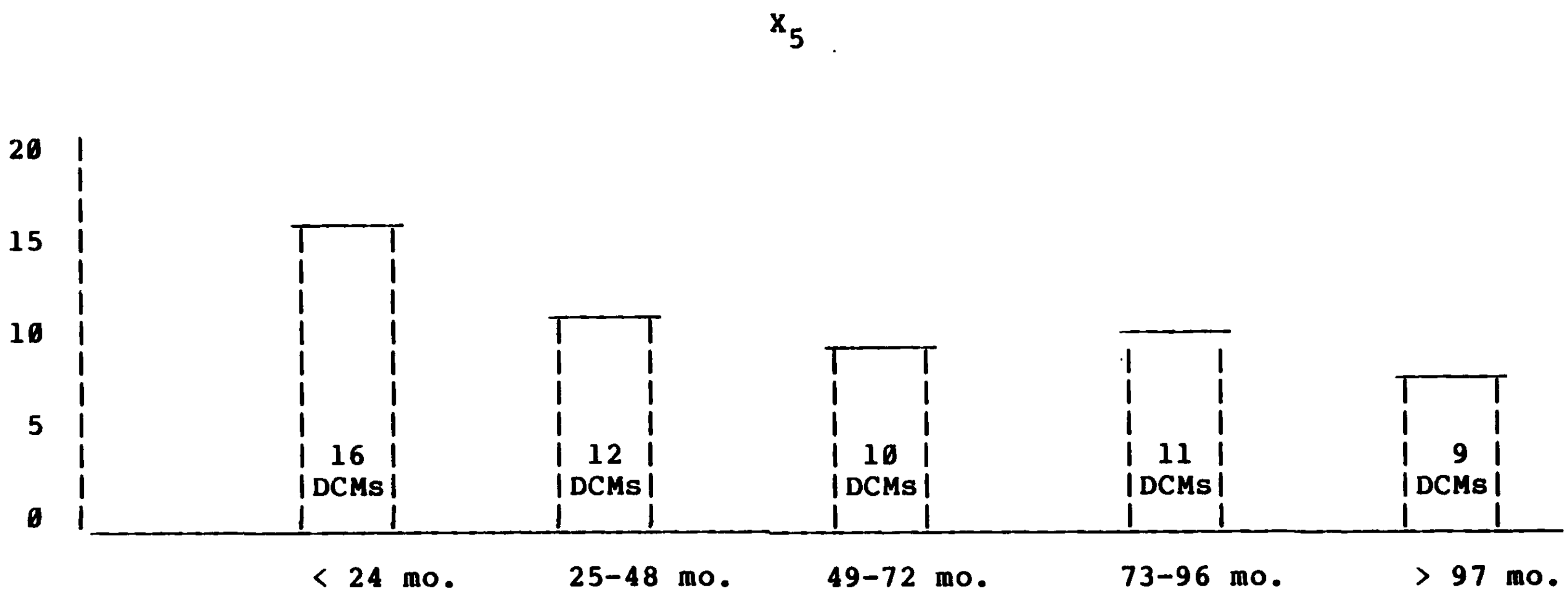

Figure 12. Number of DCMs by Number of Months of Prior Maintenance Experience

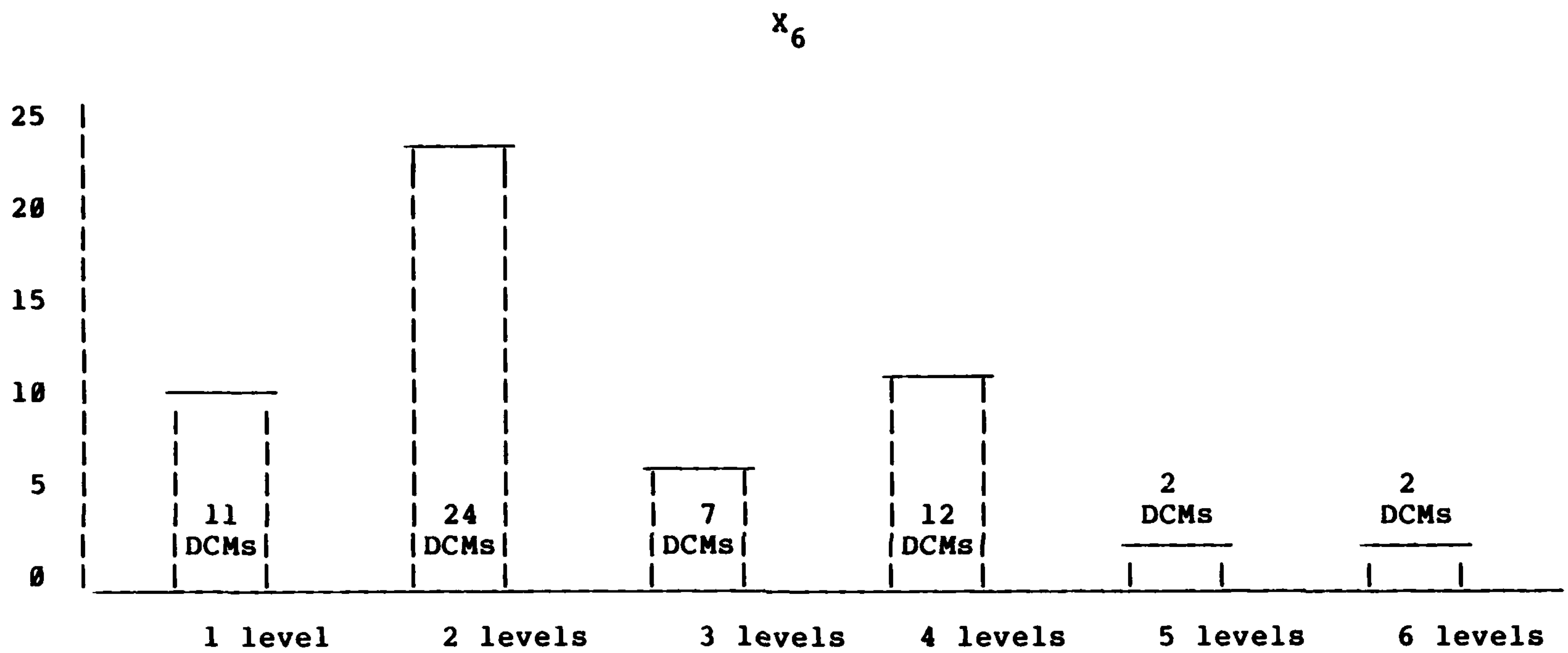

Figure 13. Number of DCMs by Number of Levels of Assignment in Maintenance Jobs

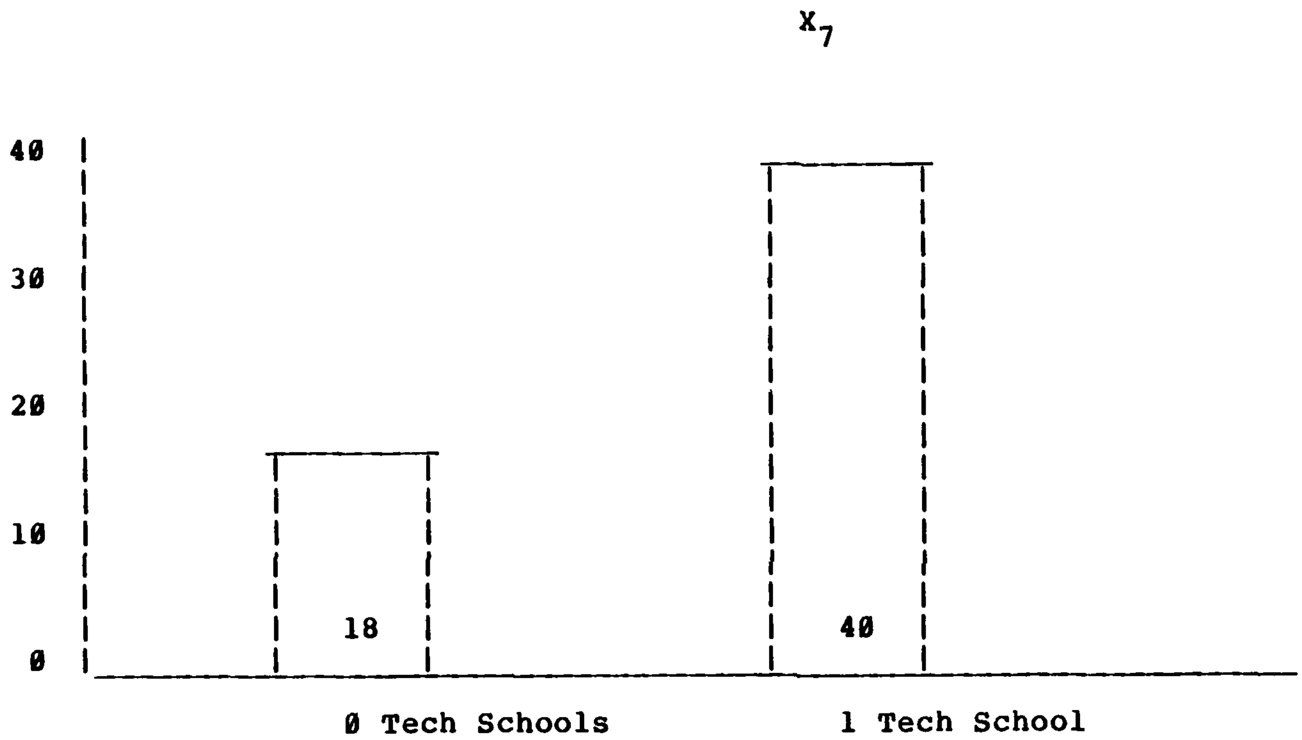

Figure 14. Number of DCMs by Number of Logistics Technical Schools Completed

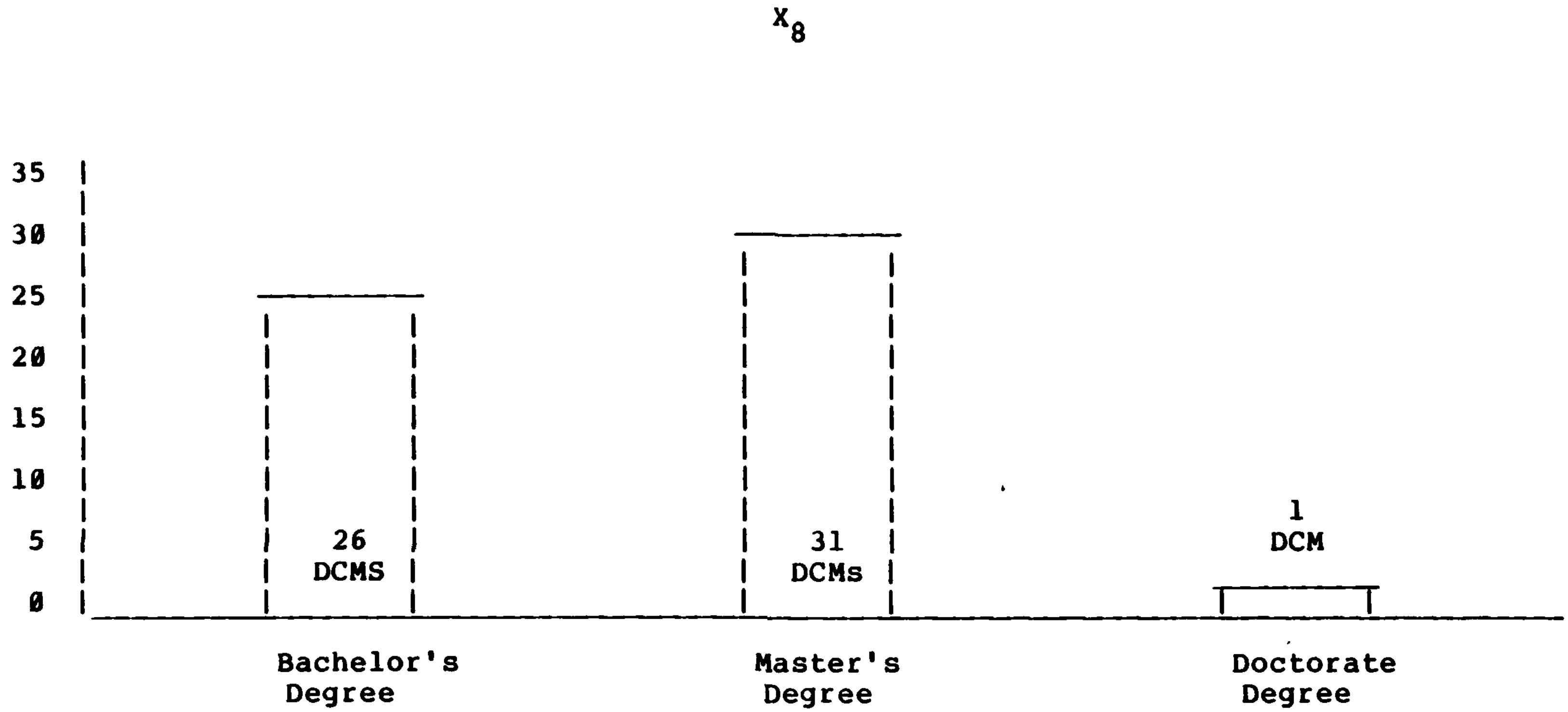

Figure 15. Number of DCMs by Formal Educational Level

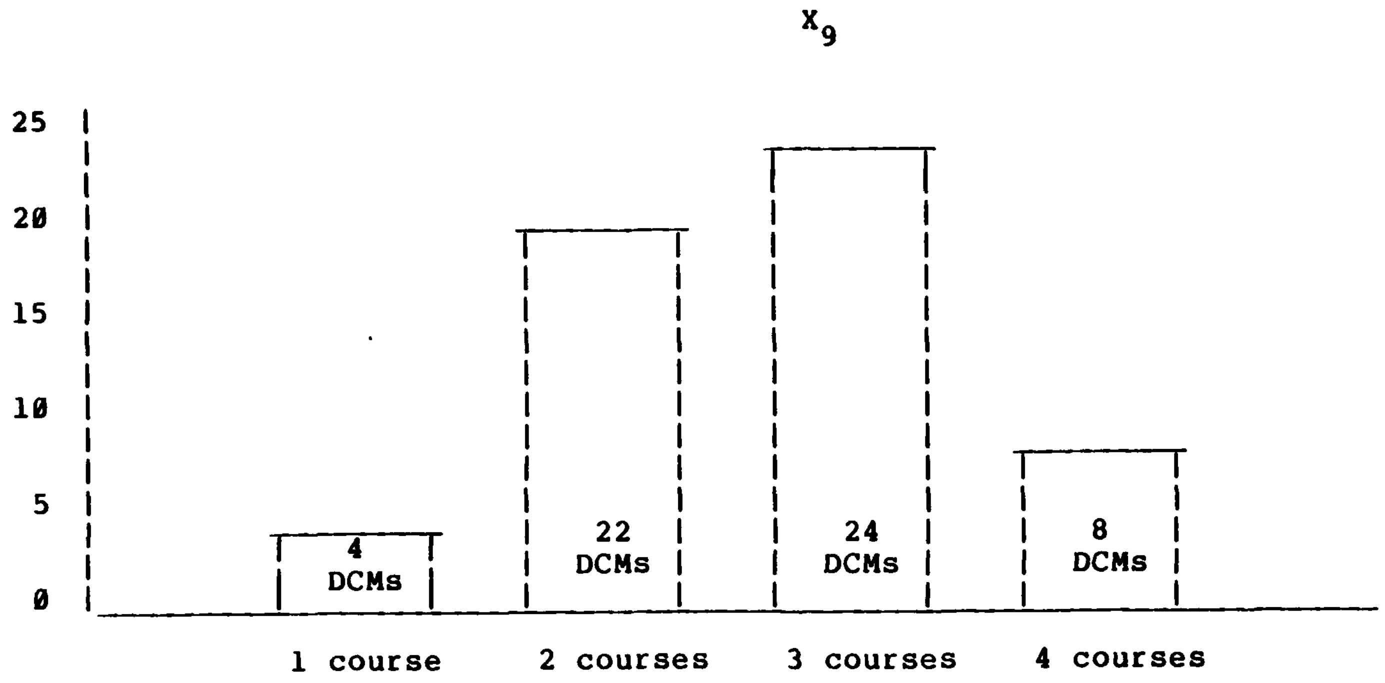

Figure 16. Number of DCMs by Number of PME Courses Completed

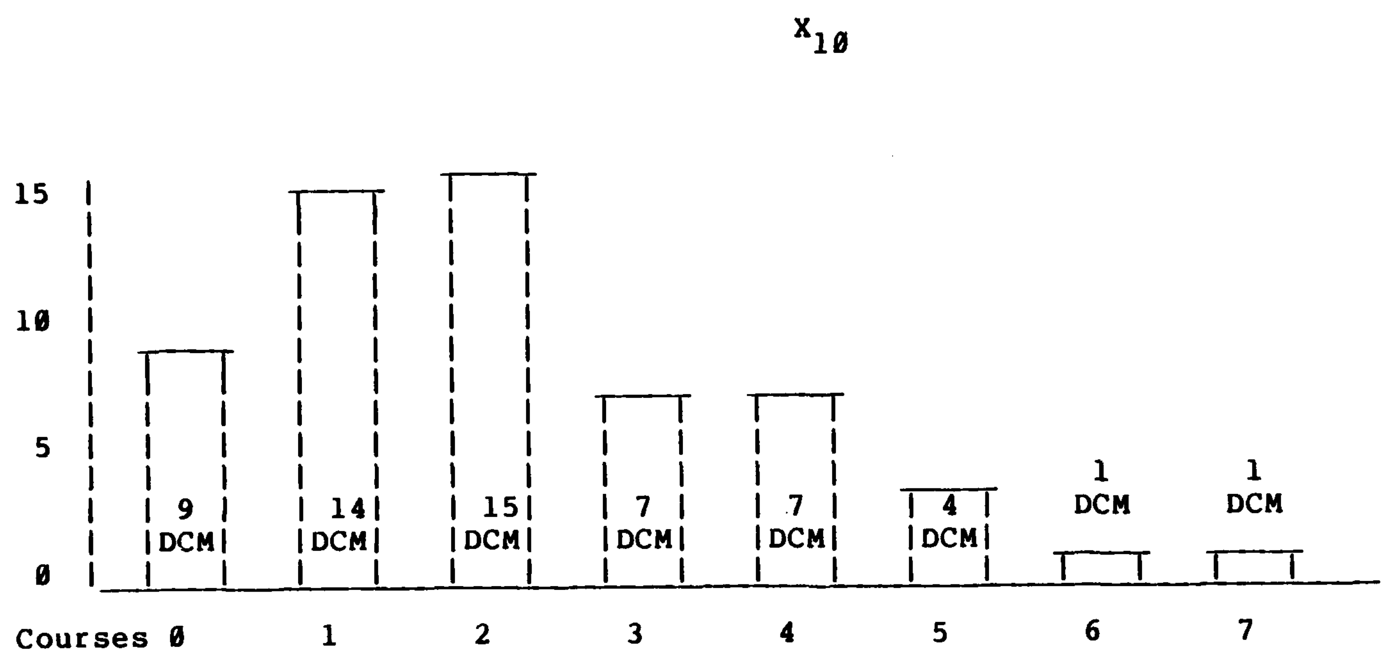

Figure 17. Number of DCMs by Number of PCE Courses Completed

X_{11}

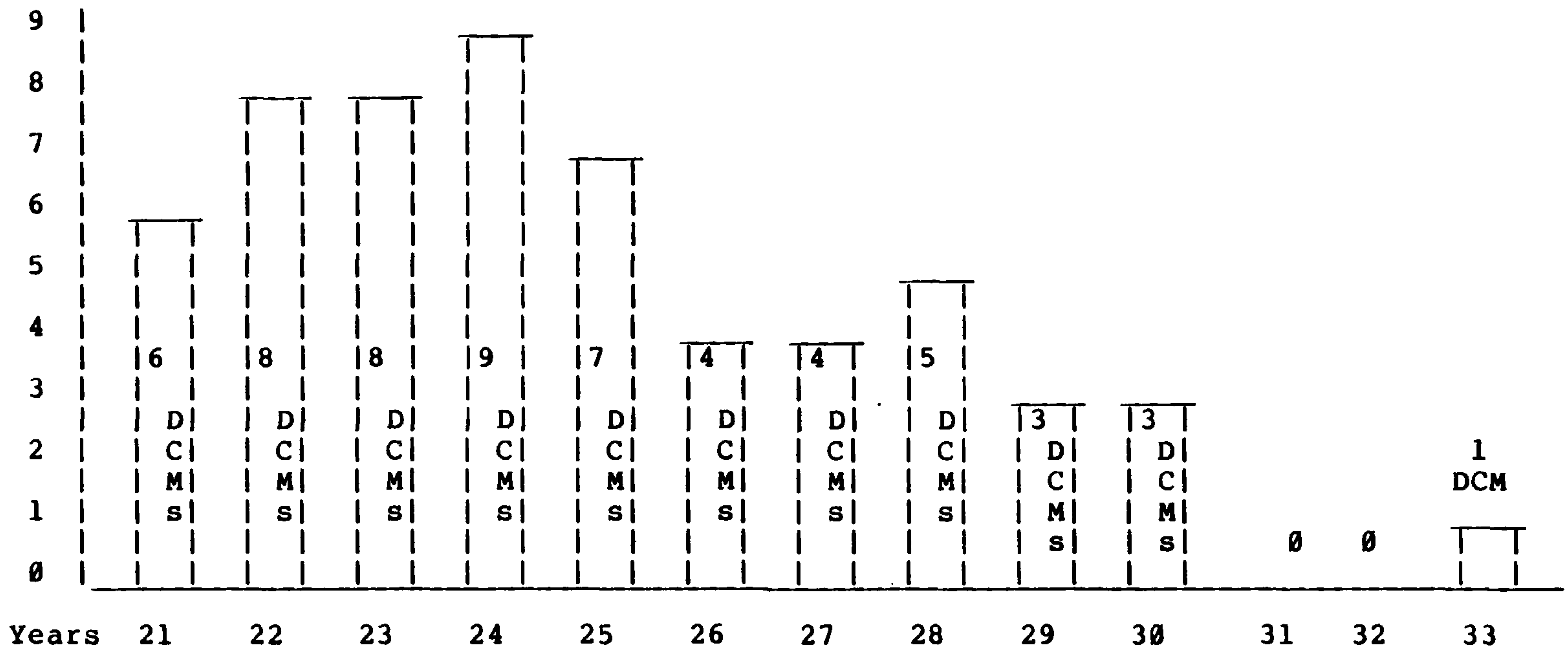

Figure 18. Number of DCMs By Number of Years of Commissioned Service

Bibliography

1. Drake, Kenneth L., Mark S. Sanders, William R. Crooks, and Gershan Weltman. Comparative Studies of Organizational Factors in Military Maintenance. Research report. Cybernetics Technology Office, Defense Advanced Research Projects Agency, Arlington VA, October 1977 (AO50 403).

2. Marquez, Leo, Lieutenant General, USAF. "Spares, Price, and Performance," Air Force Journal of Logistics, 3 (4):9-11 (Fall 1984).

3. Marquez, Leo, Lieutenant General, USAF. "Marquez: Logistics Should Play a Greater Role," Air Force Times, 20:33 (3 Dec 84).

4. HQ AFLC/XRPM. Introduction to The Air Force Logistics Command: Lifeline of The Aerospace Team. Action Officer Handbook. Washington: Government Printing Office, 1984.

5. Rider, Graham W., Robert M. Canady, and Lonnie L. Ostrom. An Approach to Management Education. Faculty report. Air Force Institute of Technology, Wright-Patterson Air Force Base OH, Dec 1970.

6. United States Air Force Leadership and Management Development Center. Curriculum Plan Deputy Commander for Maintenance Course (DCMC). Gunter Air Force Base AL, (undated).

7. Department of the Air Force. Officer Personnel: Officer Classification. AFR 36-1. Washington: HQ USAF, 1 January 1984.

8. Department of the Air Force. Officer Personnel: Officer Career Development. AFR 36-23. Washington: HQ USAF, 26 December 1979.

9. Anthony, Robert N. and Regina Herzlinger. Management Control in Nonprofit Organizations. Homewood IL: Richard D. Irwin, Inc., 1975.

10. Strauss, George and Leonard R. Sayles. Personnel: The Human Problems of Management, (Fourth Edition). Englewood Cliffs NJ: Prentice-Hall, Inc., 1980.

11. Bray, Douglas W. and Others. Formative Years in Business. New York: John Wiley & Sons, 1974.

12. Walker, Charles R., Maj, USAF. Chiefs of Maintenance: A Study of Productivity Versus Experience. Research Study. United States Air Force, Air Command and Staff College, Air University, Maxwell Air Force Base AL, 1975.

13. Department of the Air Force. Project Broadlook. Survey report. Randolph Air Force Base TX: AFMPC/YPS, 1982.

14. Department of the Air Force. USAF Supply Manual. AFM 67-1. Washington: HQ USAF, 10 June 1985.

15. Mayfield, Capt Edward D. and Capt Robert W. Walter Relationship Between the Initial Duty Assignment and Successive Assignments in the Aircraft Maintenance Career Field. MS thesis, LSSR 30-80. School of Systems and Logistics, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1980 (AD-AO87 504).

16. Devore, Jay L. Probability & Statistics for Engineering and the Sciences. Monterey CA: Brooks/ Cole Publishing Company, 1982.

17. Department of the Air Force. Aerospace Vehicle and Equipment Inventory, Status, and Utilization Reporting System (AVISURS). AFR 65-110. Washington: HQ USAF, 1 April 1980.

18. Byrd, Colonel, TAC Deputy LGM. Telephone interview. Tactical Air Command Headquarters, Langley AFB VA, 1 March 85.

19. Morton, Colonel, SAC Deputy LGM. Telephone interview. Strategic Air Command Headquarters, Offutt AFB NE, 1 March 85.

20. Fletcher, Colonel, MAC Deputy LGM. Telephone interview. Military Airlift Command Headquarters, Scott AFB IL, 1 March 85.

21. Reed, Colonel, ATC LGM. Telephone interview. Air Training Command Headquarters, Randolph AFB TX, 1 March 85.

22. Nie, Norman H., and others. SPSS: Statistical Package for the Social Sciences. 2nd ed. New York: Mc Graw-Hill Book Company, 1975.23.

Kerlinger, Fred N., and Elazar J. Redhazur. Multiple Regression in Behavioral Research. New York: Holt, Rinehart and Winston, Inc., 1973.

24. Department of the Air Force. Equipment Maintenance: Aircraft/ICBM Maintenance Analysis Guide. SACP 66-17. Offutt AFB NE: HQ SAC, 13 January 1984.

25. Department of the Air Force. Management Analysis: MAC Management System. MACR 178-4. Scott AFB IL: HQ MAC, 24 August 1983.

26. Department of the Air Force. Equipment Maintenance: Unit Performance Data Reporting. TACR 66-18. Langley AFB VA: HQ TAC, 12 October 1983.

27. Department of the Air Force. Equipment Maintenance Policy. AFR 66-1. Washington: HQ USAF, 21 April 1983.

28. Siegal, Sidney. Non-parametric Statistics. New York: McGraw-Hill Book Company, 1956.

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Thesis Advisor: David E. Lloyd, Lt Col, USAF
Assistant Professor, Department of Logistics Management

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Abstract

This ~~research effort~~ investigated limited breadth of experience (stovepiping) and limited depth of experience as they relate to the aircraft maintenance Deputy Commander for Maintenance (DCM). The investigation first looked for evidence of these conditions in the DCM career field. The research then attempted to determine what relationships existed between these factors and the DCM's effectiveness. The aircraft mission capable (MC) rate was used as a measure of effectiveness for the purposes of this research.

The first portion of the research was accomplished by comparing sample descriptive statistics to the suggested and required experience factors from Air Force Regulations 36-1 and 36-23. The results ~~from this phase of the research~~ show evidence of limited breadth and depth of experience within the DCM career field.

The second part of the research utilized contingency table analysis and the Chi-square statistic to test for relationships between experience and effectiveness. Results from this portion of the research were inconclusive because the large F probabilities that were obtained. In each contingency table, the F value indicated that the results could have been obtained purely by chance. Thus, while limited breadth and depth of experience do exist at the DCM level, statistically valid conclusions concerning any relationships between experience and effectiveness could not be drawn.

Recommendations which followed from this research centered on the problems encountered in this effort. The author feels that these problems, which precluded conclusive results, were the result of a small sample and an incomplete measure of effectiveness. Thus, future researchers in this area should utilize a more complete measure of DCM effectiveness and try to obtain a larger sample.

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